MSOE UNIVERSITY

CULMINATION

SENIOR PROJECT SHOWCASE 2025–26

DESIGN PROJECTS | INTERNSHIPS | THESIS PROJECTS

Friends of MSOE:

Senior projects at MSOE are a long-standing tradition. The showcase is in large part a celebration: an opportunity for friends and family, faculty and staff, and community partners and corporate sponsors, to bear witness to the bodies of work that define the graduating class.

Every fall, MSOE seniors across program areas put the knowledge they've gained and skills they've honed over their academic career to the test. Working with faculty advisors and industry partners, they form teams—or work individually—to solve a problem, improve a product or process, or create something entirely new. After months of learning and discovery, building and deconstructing, successes and failures, the culmination of these efforts are put on display during the Senior Project Showcase.

The showcase is filled with great optimism and inspiration. Navigating the mazes of student excellence on display, we can only imagine where they will go next and what they will accomplish, knowing only—and with great certainty—that it will be extraordinary.

Have a project idea?

Send your suggestion to Angela Rome, executive assistant, by Aug. 2 to be considered for the 2026–27 academic year. Include a brief description of any senior design project, class project or internship position along with the name, address, email address and telephone number of the project contact person. Project ideas submitted for engineering courses must have a significant design component. Submit ideas to:

VP of Academics Office
1025 N. Broadway
Milwaukee, WI 53202-3109
(414) 277-7190
rome@msoe.edu
msoe.edu/senior-projects

Senior Design

The following list of senior design projects, class projects and internships, compiled with the help of the academic department chairpersons and program directors, represents an important segment of student academic activities conducted during the 2025–2026 year. A variety of projects were completed, some for outside organizations and some for the benefit of the university.

MSOE has a very strong relationship with industry, and many senior design projects often originate in companies where students work as interns. Senior engineering students work in teams on senior design projects, which most students begin planning in the spring of their junior year.

Most engineering senior design projects run through the Fall and Spring Semesters. In the fall, design teams define a design problem, identify several alternative solutions and develop a project plan for evaluating the possible solutions and solving the problem.

Students develop a thorough project proposal, often working with the MSOE Institutional Review Board. The Spring Semester emphasizes design, where students draw from their specialty courses. At the end of the design project, students are expected to have produced complete project documentation and written reports and oral presentations are required.

Business students must complete an internship in the area of their intended career as part of their curriculum. Internships allow students to apply the skills that they have learned in the classroom in a work setting.

User experience students work on senior design projects in Fall Semester working closely with stakeholders to define the problem, conduct needed user research and design a solution. The project results in extensive documentation of the process for use by the stakeholder, as well as a poster and oral presentation.

Nursing students complete senior research projects. Collaborating with staff nurses, nurse administrators and physicians, they work to implement a change in some aspect of the health care process.

Actuarial science students conduct research projects and case studies that examine data, variables, risk factors and more to provide analyses and insights on varying scenarios. They may offer solutions or present their findings at competitions.

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Guests may park in the State Street Lot,
501 E. State Street.

Civil and Architectural Engineering and Construction Management Department

The Civil and Architectural Engineering and Construction Management Department senior design project is a pseudo-design/build or design/bid/build project involving a client, faculty team and industry mentors.

The project teams are composed of students from the architectural engineering (with design specialties in structural, mechanical, and electrical), civil engineering (with specialties in structural, environmental and water resources, transportation, and construction) and construction management programs. The multi-term project starts with programming and includes the design concept through development, working drawings and construction management. The design process includes engineering systems selection and analysis.

Construction management includes construction methods, project feasibility, estimating and cost analysis, and project scheduling. Presentation and communication skills are reinforced by the formal presentations to a jury consisting of the client and construction industry representatives.

TEAM MEMBERS

Sonja Gaudynski
Jake Hamann
Abby Krug
Sadie LaHaie
Brody O'Connor
Ander Pieper
Adolfo Sanchez
Ruby Semenchuk
Peyton Thomas

FACULTY ADVISORS

Gage Christianson
David Grassl
Brian Norby
Cory Powers
Jayme Radomski
Mark Rounds
Andrew Walther

TROJAN HORSE CONSTRUCTION

Civil and Architectural Engineering and Construction Management Projects

MSOE STEM Center Expansion

The MSOE STEM Center Expansion builds onto the current space through the addition of a two-story structure, at roughly 30,000 square-feet. As a part of the university, the STEM Center aims to encourage aspects of the MSOE Mindset; these aspects include fostering curiosity and connections, community building, and creating value. With curiosity in mind, the design has open ceilings highlighting exposed steel structures and various building systems with windows into mechanical and electrical spaces. Open to the community, this space hosts robotics competitions for K–12 students along with study spaces for MSOE students. Features of the addition include a full-sized Robotics FRC field located in a two-story space for spectator viewing, which allows for the utilization of full size-apparatuses. With three additional classrooms and expanded maker spaces for robotics fabrication and STEM exploration, local students can explore advanced learning opportunities.

TEAM MEMBERS
Jeff Beard
Evander Craig
Gramm McCormack
Arianna Moore
Riley Ott
Maggie Sanderson
Ray Tinianow
Vinny Weidner

FACULTY ADVISORS
David Grassl
Brian Norby
Cory Powers
Jayme Radomski
Mark Rounds
Andrew Walther
Kurt Zimmerman

U.P. CONSTRUCTION

MSOE Stem Center Expansion Project

Ultimate Precision Construction is expanding the existing MSOE STEM Center to be a three story, 69,000 square-foot building designed to embody the MSOE Mindset. The building will be constructed in a green space directly north of Viets Field and will connect seamlessly to the existing STEM Center. The new facility will include STEM-focused classrooms, flexible learning environments that support collaboration, and a First Robotics field capable of hosting robotics competitions. A viewing space on the third floor will allow for spectating athletic events on Viets Field and hosting events. A green roof and solar sunflowers are some sustainable focal points of the project. In addition to the new construction, the project includes renovating the existing STEM Center to improve functionality. The expansion will serve as a welcoming learning environment for K–12 students, inspiring the next generation of innovators through exposure to STEM education.

TEAM MEMBERS
Ethan Allen
Lily Antczak
Jonah Bertram
Jaeden Carstens
Elijah Krumbein
Nox Sistek
Austin Taivalmaa
Kyle Wild

FACULTY ADVISORS
David Grassl
Brian Norby
Tamara Omari
Cory Powers
Jayme Radomski
Mark Rounds
Kurt Zimmerman

Keystone Horizons
A Design & Construction Firm

Avenues Point Project

Keystone Horizon's senior design project is in Milwaukee, just south of North Avenue between 21st and 22nd Streets. The site is the westernmost parcel within a group of surrounding development sites. This larger development project aims to elevate the area to its full potential as a gateway community between downtown and suburban life. The project focuses on mixed-use residential living, with an emphasis on the missing middle. The large development block between 21st and 22nd streets, just off North Avenue, has been designed to include townhouses and an apartment building with street-facing commercial spaces. The buildings have been designed to wrap around a large central green space, bringing the separate buildings together and blending the apartments' urban aspect with the townhomes' suburban feel.

TEAM MEMBERS

Jaden Dias
Andrew Hamilton
Weston Klien
Bruno Martinez Cabezuelo
Avery Michaels
Jacqueline Navarro
Samira Perez
Claudia Quint
Jordan Skolmar

FACULTY ADVISORS

Gage Christianson
David Grassl
Brian Norby
Cory Powers
Jayme Radomski
Mark Rounds
Andrew Walther

BLUE HORIZON
ENGINEERING

MSOE STEM Center Expansion

The MSOE STEM Center Expansion adds a 3-story, 47,383 square-foot structure to the existing STEM Center space. The addition features high ceilings, a full FRC field with an atrium, more classrooms, additional office and break space for faculty, and study spaces for current MSOE and STEM Center students. Architecturally, the building is designed to allow vast amounts of natural light with two skylights and a large window façade, also serving as exposure to potential donors. The STEM Center addition aims to align with the current values of the existing building and facilitate how teaching is currently conducted while allowing students the opportunity to learn, grow, and be inspired.

TEAM MEMBERS
Noel Dahl
Isaiah Maydole
Jen Miller
Cody Zenyuh

FACULTY ADVISORS
Kristen Belan
Dr. Salah Sarhat

Kinnickinnic River Flood Management Project

This project is in connection with the reconstruction of the bridges across the Kinnickinnic River at S. 9th Place and S. 13th Street in the Lincoln Village neighborhood in Milwaukee. Through the Fall Semester, the water team developed four alternatives for the removal and replacement of the current concrete lining of the stretch of the Kinnickinnic River from S. 13th Street to S. 9th Place. The existing channel was straightened and lined with concrete in the early 1960s in an attempt to counteract growing flooding concerns. The team plans to remove the existing concrete, widen the floodplain to better account for high volume rain events, and return the low flow channel bed to a more natural meander. This will involve the replacement of the concrete channel bed with river rock and banks with natural vegetation, as well as the addition of riffles, pools, and habitat structures throughout the channel to support wildlife in the river. The team will also plan for a multi-use path running along the bank of the river and under the bridges to allow for easier public access of the river and provide an alternative pedestrian path to cross S. 9th Place and S. 13th Street without risking interaction with motor vehicles. Over the course of this project, we have worked closely with the city of Milwaukee and the Milwaukee Metropolitan Sewerage District to ensure our design choices align with the goals of the public.

TEAM MEMBERS
Jessa Alderman
Samantha Blake
Andrew Doyle
Emma Gossman
Tanner Samson
Jacob Schmitt
August Wassmann

FACULTY ADVISORS
Kristen Belan
Gage Christianson
Dr. Mitzi Dobersek
Dr. William Gonwa
Dr. Xi Song
Dr. Salah Sarhat

Underwood Creek Stream Restoration and Box Culvert Reconstruction Project

The Underwood Creek Stream Restoration and Bridge project is located in the Willaura subdivision in Brookfield, WI. The project encompasses a streambank restoration of Underwood Creek from Santa Maria Ct. to Indian Creek Parkway. Additionally, the project includes a new cast-in-place box culvert over Underwood Creek at Woodbridge Rd. and storm sewer improvements within the roadway and along the streambank. This project aims to improve safety, reduce flood risk, restore ecological function, and ensure long-term community resilience. The team behind this project is Rock Solid Solutions. Rock Solid Solutions has worked closely with the City of Brookfield, Wisconsin DNR, the Army Corps of Engineers, and WisDOT to ensure that the project meets all local, state, and national requirements. Throughout the work completed this semester, the team has fostered strong relationships with the Brookfield Community to implement a sustainable and reliable hydraulic solution.

TEAM MEMBERS
Noel Dahl
Giovanni Deluca
Joseph Estrada
Jerome Lindsey
Isaiah Maydole
Gillian McDaniel
Raymond Zanarini

FACULTY ADVISORS
Kristen Belan
Dr. Gretchen Bohnhoff
Gage Christianson
Dr. Mitzi Dobersek
Dr. Salah Sarhat
Dr. Xi Song

South 13th Street Bridge Over the Kinnickinnic River Reconstruction

MEDLZ Engineering was tasked with redesigning the S. 13th Street Bridge which spans over the Kinnickinnic River. The bridge is a part of a larger scale project that has come about due to a current lack of hydraulic capacity in the Kinnickinnic River. Clients of the project, namely the City of Milwaukee and the Milwaukee Metropolitan Sewerage District (MMSD), decided it would be best to expand the watershed. This expansion has led to a complete redesign and reconstruction of S. 13th Street Bridge. This redesign accounts for an increase in overall span length measuring from bearing to bearing of 62.5 ft. to 175 ft. The bridge is currently a steel girder style bridge, and we have chosen to replace it with a prestressed girder bridge implementing a precast deck. The bridge is a crucial point of transportation across the Kinnickinnic River, this fact aided in our design keeping the community paramount in our decisions.

TEAM MEMBERS
Cole Beilke
Tyler Calderwood
Jorja Hamlin
Amy MacDonald
Brooke McAllister
Melissa Pacheco-Paz
Jonas Roehl
Brady Schmidt
Hannah Siedschlag
Jaden Zaver

FACULTY ADVISORS
Kristen Belan
Gage Christianson
Dr. Mitzi Dobersek
Dr. Salah Sarhat

Reconstruction of North Calhoun Road from Gebhardt Road to West North Avenue in Brookfield, WI

The project involves reconstructing North Calhoun Road from Gebhardt Road to West North Avenue in Brookfield, WI. The corridor supports a mix of land uses, including residential neighborhoods, commercial businesses, municipal buildings, schools, and community facilities. The goals for the project include rehabilitating the pavement, addressing and improving minor drainage issues, updating pedestrian facilities to meet ADA standards, improving intersection geometry where necessary, redesigning the roadway with complete-streets ideals, maintaining and enhancing the aesthetics of the roadways, and improving safety for all roadway users.

TEAM MEMBERS
Christian Bosque
Kylie Crum
Alexis Fleegel
Alexander Le
Jennifer Miller
Cody Zenyuh

FACULTY ADVISORS
Professor Kristen Belan
Professor Gage Christianson
Dr. Salah Sarhat
Dr. Xi Song

South 9th Place Bridge Replacement

The team is designing a replacement bridge on South 9th Place crossing the Kinnickinnic River. The current bridge is a single span, 65 ft. long and 55 ft. wide. The team performed an on-site inspection and found significant rusting, corrosion, cracking, and expansion of joints. These findings led to the conclusion of a full bridge replacement. In addition, MMSD is planning a river widening of the Kinnickinnic River; see the Kinnickinnic River group abstract for more info. The new bridge that the team has designed is a three-span steel girder bridge with a cast-in-place concrete deck. The new spans are 53 ft., 69 ft., and 53 ft., for a total of 175 ft. to compensate for the widened river. The 55 ft. width is staying the same, but the lanes are being narrowed from 18 ft. to 14 ft. to allow for bike lanes. The team is designing the concrete deck and reinforcement, steel girders, piers with reinforcement, and piles under piers with consideration of HL-93 loading.

TEAM MEMBERS
Nikolin Cina
Jenna Fabian
Nicholas Gueldner
Ada Parker
Dominic Reed
Ellysa Shay
Mathew Turnbull

FACULTY ADVISORS
Gage Christianson
Dr. Fran Mahuta
Dr. Salah Sarhat
Dr. Anne Schwarzkopf
Dr. Xi Song

Village of Sussex Water Pollution Control Facility

The project consists of designing a method to extend the storage capacity of biosolids within the Village of Sussex Water Pollution Control Facility. This plant serves the Village of Sussex, as well as parts of the Village of Menomonee Falls, the Village of Lannon, and the Town of Lisbon. The objective is to design a new aerobic digester to improve biosolid retention duration, along with investigating the use of cake drying systems for land applications of biosolids. All tasks are being performed with considerations of community impact and plant management capabilities.

TEAM MEMBERS
Zachary Dannecker
Jack Fisher
Caroline Fouras
Hayden Hesse
Lance Jumbeck
Amichai Orkin
Jacob Silverberg
Dawson Smith
Abby Weed

FACULTY ADVISORS
Kristen Belan
Dr. Gretchen Bohnhoff
Gage Christianson
Dr. Mitzi Dobersek
Dr. Salah Sarhat
Dr. Xi Song

Gebhardt Road Bridge Over Dousman Ditch Reconstruction Project

Gebhardt Road Bridge, between Pilgrim Pkwy and Calhoun Road in the City of Brookfield and the Village of Elm Grove, is in dire need of a full replacement. The existing bridge is failing basic safety standards for the public, community, and local schools who rely on the bridge every day. The bridge's lack of sidewalks and clear deterioration of the structure make a full reconstruction absolutely necessary. To keep the bridge open for school traffic, the bridge closure must be limited to the summer months when school is not in session. An accelerated bridge construction approach has been selected using prefabricated elements in order to accommodate the time constraint of being open before the school year. As part of the reconstruction project, a new right-turning lane will be added to the eastbound direction, along with mixed-use sidewalks on both sides of the roadway to allow for future development.

TEAM MEMBERS
Max Beauthin
Alicia Carella
Sam Fleischman
Jackson Hughes
Onnikah Oliver
Jordan Pollnow
Cole Sitterley
Maggie Thillman
Habiba Watfa

FACULTY ADVISORS
David Grassl
Brian Norby
Tamara Omari
Cory Powers
Jayme Radomski
Mark Rounds

Avenue Point Development

Avenues Point is a mixed-use development project designed to bridge the gap between Downtown and West Milwaukee, Wisconsin. This site features three major projects including a five-story mixed-use apartment complex, three multi-family housing units, and a historic building restoration repurposed into a community coffee shop. This development provides a new vibrant, walkable gateway for young individuals and families in the West Milwaukee area. The Paramount Construction team's scope consists of MEP system design, structural engineering, cost estimation, and construction scheduling. A primary focus has been placed on the mixed-use apartment complex, emphasizing the integration of sustainable building systems to ensure long term viability, sustainability, and resilience. The renovated coffee shop and multi-family housing will serve as supplementary pieces of the development meant to tie the area together complementing the existing Lindsay Heights neighborhood.

TEAM MEMBERS

Jayden Correia
Brennan Dickey
Mason Eckhardt
Clay Kapraun
Jenna Kent
Adam Lindemann
Callie Nelson
Sophia Schifano
Collin Van Dam

FACULTY ADVISORS

David Grassl
Brian Norby
Tamara Omari
Cory Powers
Jayme Radomski
Mark Rounds
Kurt Zimmerman

Avenue Point Development

Avenues Pointe Project proposes a mixed-use residential development in Milwaukee along W. Fond du Lac Ave. and N. 20th St., designed to bolster community interaction, sustainability, and local economic activity. The campus consists of two residential buildings interconnected by an underground parking structure. Avenues Pointe features a rooftop beer garden, providing a grand view of downtown Milwaukee. Dedicated retail spaces along the street front allow small businesses to rent storefronts, which bring life to the neighborhood. Sustainability plays a central role in the design, including mass timber structural components, daylighting strategies that maximize natural light, solar energy systems, and water-capture. In addition to 74 individual housing units, the project emphasizes shared community spaces, including a large central green space intended to bring residents and visitors together. A technology center provides space for classes, collaborative learning, technical support, VR experiences, gaming, and other technology-focused activities that encourage innovation and social engagement.

Diercks School of Advanced Computing

Computer Science and Software Engineering Senior Design Student Projects

AI Aphasia Therapy

TEAM MEMBERS
Mahim Chokshi (CS)
Marija Goranovic (CS)
Joelle Harrington (CS)
Evan Schubert (CS)
Preston Whitcomb (CS)

ADVISOR
Rob Bardunias

SPONSOR
Medical College of Wisconsin (MCW)

This project develops an accessible application that recognizes and evaluates speech from individuals with aphasia. The goal is to support speech rehabilitation by providing automated, real-time feedback on spoken naming tasks. The system integrates multiple speech-recognition models tailored to the atypical and nonstructured speech patterns associated with aphasia, enabling it to generate transcripts, estimate correctness, and track users' progress over time. Through a simple and clean interface, the app allows patients to practice independently wherever and whenever they choose, while clinicians can review performance data to inform therapy. Designed to be portable, user-friendly, and clinically meaningful, the project bridges artificial intelligence with speech pathology to expand access to therapeutic support outside the clinic and improve patient outcomes.

AIM

TEAM MEMBERS
Adam Haile (CS)
Grace Ivey (CS)
Benjamin Leshin (UX)
Aiden Miller (CS)
Tyge Plater (SE)

ADVISOR
Gabe Wright

AIM is an AI-centric automation platform that allows users to build workflows by visually linking steps to turn ideas into real actions. The goal of AIM is to help students and faculty apply AI and automation meaningfully to their coursework, research, and daily work, while allowing technical users to build and experiment quickly without managing infrastructure. This approach enables learning for new users without preventing experienced developers from working on higher-level problems. The platform provides immediate access to Rosie and its associated language models, enabling streamlined access to computing resources already available to students and faculty. As a starting point for more advanced work, AIM balances accessibility with technical capability to support learning and innovation at MSOE.

TEAM MEMBERS
Leigh Goetsch (CS)
Jack Rosenbecker (CS)
Colby Sehnert (CS)
Carson Smith (CS)

ADVISOR
Dr. James Lembke

SPONSOR
Korey Streich

Litter Bot

Our project tackles one of Milwaukee's most visible quality-of-life challenges: litter. The city spends hundreds of thousands to millions of dollars each year on cleanup, yet trash still accumulates in parks, sidewalks, and shared public spaces. To tackle this problem, our team is using open-source robotic platforms to build a semi-autonomous litter-collection robot. The system is built on a Unitree Go2 Air quadruped platform, with a LeRobot SO-101 robotic arm mounted on top. A camera on the robot detects and identifies common litter using computer vision, while the arm uses a reinforcement learning model to adapt how it grasps different types of litter. We hope to create a platform that won't replace existing cleaning crews but rather compliment them, allowing for them to better clean our streets one piece of litter at a time.

TEAM MEMBERS
Sam Hohenstein (SE)
Wyatt Jens (SE)
Ryan Peter (SE)
Patrick Saxton (SE)
Alton Wimer (SE)

ADVISOR
Dr. James Lembke

SPONSOR
Direct Supply (Megan Passo, Amanda Koehler)

Maxwell Thomas Manufacturing Website

The purpose of this project is to migrate and integrate the Maxwell Thomas (MxT) website into Direct Supply internally. This is primarily driven by the goal of modernizing and consolidating digital infrastructure while enhancing the customer and stakeholder experience. The current MxT site lives outside of Direct Supply and presents inconsistencies in design, imagery, product data, and usability akin to other Direct Supply sites. These issues cause inefficiencies for designers, sellers, and sales teams, leading to friction in product discovery, quoting, and customer purchasing. This project aims to reduce dependency on external systems and lower ongoing maintenance costs, provide a consistent and reliable digital experience across both MxT and store.directsupply.com (DSN), improving support for purchasing workflows for design and sales teams, as well as strengthening brand identity for MxT as a whole.

TEAM MEMBERS
Daniel Deal (SE)
Jackson Jones (SE)
Dakota Nelson (SE)

ADVISOR
Brian Lewis

SPONSOR
AWS
Field Theory Consulting
MSOE alumnus Mr. Bob Radke

MSOE Mail

The objective of this project is to revamp the existing mail intake system in the MSOE residence halls, implementing an improved user interface, tools to streamline the entry of mail data, and providing improved ways to inform students when they receive mail. To streamline the entry process of mail into the system for workers, we have utilized AWS OCR and Database services to allow for entry simply by taking a picture of the information on the letter or package. For the students, we aim to solve identified problems by designing an application which will make it easier to find out if you have mail. To do this, we reintroduce systems to notify students directly when they receive mail and will replace the dry-erase board used in the lobbies of residence halls with a screen to display which students have mail to pick up.

TEAM MEMBERS
Rudolph Evonich (SE)
Anthony Marchello (SE)
Alexander Pearsall (SE)
Zachary Rutkiewicz (CS, CE)
Holden Truman (CE)

ADVISOR
Rob Bardunias

SPONSORS
NVIDIA
JUCE

Multi-User DAW (MUD)

This project presents a novel digital audio workstation (DAW) enabling real-time collaborative music production. Unlike traditional DAWs requiring complex file-sharing or screen-sharing solutions, this system allows multiple users to simultaneously edit tracks, adjust parameters, and mix audio on a single project. Built using JUCE, a professional C++ framework for audio applications, the workstation provides cross-platform compatibility across Windows, macOS, and Linux. The DAW will integrate NVIDIA's Fugatto Text-To-Sound (TTS) model, enabling users to generate audio content from text descriptions directly within their workflow. Collaborative functionality leverages AWS cloud infrastructure, utilizing AppSync's GraphQL API for instant project synchronization, WebSocket APIs for live communication, and Lambda functions for serverless computation. This architecture ensures low-latency updates and seamless coordination between distributed users. The system transforms the typically solitary DAW experience into a genuine multiplayer environment, with applications in remote band collaboration, producer-artist workflows, educational settings, and professional studios.

TEAM MEMBERS
Daniel Fischer (CS)
Andrew Prudlow (CS)
Daniel Ruppin (CS)
Benjamin Weber (CS)
Theo Zinos (CS)

ADVISOR
Gabe Wright

SPONSORS
MSOE alumnus Mr. Bob Radke
Field Theory Consulting

FIELDTHEORY
CUSTOM ANTENNA DESIGN & RF SOLUTIONS

Music Learning and Transcription System

Our project makes state-of-the-art music transcription accessible to the general public and provides tools to support music learning. We offer a web-based interface for MT3, a high-performing automated transcription model. Users can upload an audio file, and the system generates a best-estimate transcription by identifying instruments and predicting the notes being played. In addition to transcription, our system includes a practice comparison feature that evaluates a user's performance against a reference recording of the same piece. This allows learners to identify differences in timing and note accuracy and better understand how their playing compares to a target performance. By combining transcription and guided comparison, we aim to create an easy-to-use tool that helps musicians improve their skills and supports educational use in classrooms.

TEAM MEMBERS
Drake Cofta (CS, MSML)
Nicholas Dickson (CS)
Gavin Jones (CS)
Toluwanimi Olatunji (CS)

ADVISOR
Brian Lewis

SPONSORS
MSOE alumnus Mr. Bob Radke
Field Theory Consulting

ORG BOOK

FIELDTHEORY
CUSTOM ANTENNA DESIGN & RF SOLUTIONS

Org Book

This project is a secure, cloud-based internal employee directory and organizational structure application. It provides an interactive company hierarchy, allowing employees to search for colleagues, view reporting relationships, and access up-to-date contact and departmental information. Key features include a layered org chart, individual profile pages, and fast search and filtering by name, role, or department, with optional offline access to cached data. The system integrates with AWS Cognito to ensure internal-only access. Built with modern web technologies and deployed in a scalable cloud environment, the tool centralizes organizational data, improves visibility into reporting structures, and streamlines communication across the company. The team would also like to thank both Field Theory Consulting and MSOE alumnus Mr. Bob Radke for generous donations of materials for this project.

TEAM MEMBERS
Luke Gagnon (SE)
Ana Knutson (SE)
Ryan Malvey (SE)
Joseph Nemeth (SE)
Alec VerStrate (SE)

ADVISOR
Brian Lewis

P.A.C.E. – Performance and Coaching Essentials

P.A.C.E. (Performance and Coaching Essentials) is a coaching and athlete management platform designed to modernize how athletic programs create, assign, and track workouts. Many teams still rely on spreadsheets or documents that are difficult to interpret, especially for athletes unfamiliar with specific exercises. P.A.C.E. provides a centralized web and mobile-friendly application where coaches and trainers can build structured workout plans, group athletes, attach instructional exercise videos, and monitor completion and progress. Athletes can log performance data such as weight, mileage, and rest times directly within the app, enabling more accurate and efficient training oversight. P.A.C.E. combines frontend, backend, and database technologies to deliver a streamlined solution for universities and athletic organizations seeking a more effective workout management system.

TEAM MEMBERS
Andy Dao (SE)
Estevan Onorato (CS)
Theodore Rett (SE)
Eric Van Zant (CS)

ADVISOR
Dr. James Lembke

Project Diana

Opportunities to apply teamwork-relevant skills are seldom available for teachers use in a classroom setting in the context of online experiences. Oftentimes, teachers will use tools such as Kahoot or QuizletLive to engage students in learning, which often either forego collaborative problem solving or don't prioritize the team building aspect of the experience. Project Diana is a web-based space-themed game that provides a classroom activity to help students work together, improve their social skills, team up with others, and solve problems as a team. This application is designed for teachers of grades 4-7 and it is able to be fine-tuned to suit a variety of classroom sizes. As such, this project services a secondary desire to provide a higher fidelity experience to foster these lesser-practiced skills and engage students.

TEAM MEMBERS
Coltrane Bautch (CS)
Gavin Danner-Rivers (SE)
Sukhbir Singh (CS)
Vamsi Sudersanam (CS)
Ethan White (CS)

ADVISOR
Rob Bardunias

RL Studio

This project is an interactive educational platform that allows users to explore concepts in reinforcement learning through hands-on exploration. The platform allows users to select from multiple RL algorithms, adjust key hyperparameters, and choose from many classic Atari game environments to train and evaluate their own reinforcement learning model's ability to play Atari games. The platform produces performance metric visualizations to allow a user to compare outcomes across different algorithm–parameter combinations. Users can gain an understanding of how RL agents learn and operate in a fun, interactive setting. The platform makes otherwise complex reinforcement learning ideas approachable for students, educators, or anyone interested in the field of reinforcement learning. Ultimately, the project aims to foster inspiration in the reinforcement learning space and even the wider field of artificial intelligence through engaging and fun exploration of the reinforcement learning process.

TEAM MEMBERS
Kadie Degner (SE)
Asher Harris (SE)
Ethan Houseworth (SE)
Levi Wolfgramm (CS)

ADVISOR
Rob Bardunias

RoadWise

RoadWise is a mobile application designed to help students, guardians, and driving instructors safely monitor and guide student drivers. The app records driving hours, routes, and conditions using GPS and mapping data, while promoting safer driving habits through structured goals and progress tracking. To minimize distractions, RoadWise limits access to other apps during active driving sessions and provides a simplified, safety-focused interface for student drivers. With a clean, modern interface and an emphasis on accountability, transparency, and motivation, RoadWise improves upon existing student driving apps by delivering a more usable, safety-conscious, and engaging experience for both supervisors and learners. The project is currently developed for iOS, with future consideration for expanded platform support.

TEAM MEMBERS
Omar Torres (SE)
Tiffany Villalobos (SE)
Michael Wood (CS)

ADVISOR
Gabe Wright

Rocky the Raider Assistant

Many personal assistants are designed for general tasks but fall short when supporting the specific needs of students and professionals. Rocky is a personal assistant focused on helping users manage and complete everyday academic and professional tasks more effectively. The assistant is designed to adapt to different workflows and help users interact with information and tools more effectively in their daily work. Rocky emphasizes transparency and user control by clearly explaining its actions and requesting approval before performing important tasks. By combining helpful automation with thoughtful user oversight, Rocky aims to provide a more reliable and trustworthy assistant experience tailored to real-world productivity needs.

Electrical, Computer and Biomedical Engineering Department

Electrical, Computer and Biomedical Engineering Senior Design Projects

3-Phase Line Reactor Wiring and Inductance Tester

TEAM MEMBERS
Logan Duga (EE)
Alexiz Gonzalez (EE)
Jaret Ornelas (EE)
Shawn Yets (EE)

FACULTY ADVISORS
Dr. Joshua Carl
Dr. Brian Faulkner
Dr. Luke Weber

SPONSORS
Allient Power
TIC
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MSOE alumnus Mr. Bob Radke

TCI | An Allient Company

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TCI is in need of a line reactor tester that can quickly check their 3-phase line reactors for wiring errors and proper inductance. We are designing a testing fixture that will be able to provide rated current, measure voltage and current, and provide the testing results using a microcontroller and LCD display. Rated current will be supplied to a single-phase of the reactor using a variac in series with a transformer, and the necessary voltage and current measurements will be taken with a STM microcontroller by using its ADC. The test results will be displayed via the LCD.

Adaptive Seating System

TEAM MEMBERS
Maxwell Babich (BME)
Nana Ama Boakye (BME)
Connor Rhyce (BME)
Gabrielle Scott (BME)

FACULTY ADVISOR
Dr. Charles Tritt

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The Adaptive Seating System is a smart ergonomic office chair designed to monitor user posture and provide real-time adjustment recommendations. Integrated sensors capture postural data, which a dedicated mobile app processes to calculate optimal settings for the neck, lumbar, and hip supports. While maintaining the aesthetic of a professional office chair, the system features a built-in 8-hour battery, providing a full day of wireless functionality and unrestricted movement. Users can easily recharge the system overnight via a standard outlet. By bridging the gap between biometric feedback and manual adjustability, the Adaptive Seating System empowers users to maintain healthy spinal alignment throughout the workday, reducing the long-term physical strain associated with sedentary office environments.

TEAM MEMBERS
Tim Olson (BME)
Jake Wener (BME)
Brandon Willenbring (BME)

FACULTY ADVISOR
Dr. Charles Tritt

SPONSORS
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Field Theory Consulting
MSOE alumnus Mr. Bob Radke

Adaptive Thermal Comfort Vest (ATCV)

The Adaptive Thermal Comfort Vest (ATCV) is a smart heated vest designed to automatically keep users warm in cold environments without requiring manual adjustment. Current consumer heated vests rely on fixed heat settings and offer no physiological sensing, leading to discomfort and wasted energy. Our design integrates heating elements, environmental sensors, and physiological signals (skin temperature, heart rate, and activity level) to regulate warmth intelligently. We developed a dual loop control system that adjusts heater output in real time and refines comfort using a PMV- based model. This semester, we selected components, built a simplified control architecture, tested heating elements and batteries, and integrated hardware into a tailored vest with guidance from Edessa Fashion. The ATCV provides rapid warming, extended battery options, and removable electronics for washability, positioning it as an innovative and accessible solution for personalized thermal comfort.

TEAM MEMBERS
Sydney Hengehold (BME)
William Lassiter (BME)
Faith Papazoglou (BME)
Joseph Pearson (BME)

FACULTY ADVISOR
Dr. Ahmed Sayed

SPONSORS
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MSOE alumnus Mr. Bob Radke

AI Assisted Retinal Screening Device for Diabetic Retinopathy

Diabetic retinopathy (DR) is a leading cause of preventable vision loss worldwide, yet early detection is often limited by the cost, size, and accessibility of traditional retinal imaging systems. To address this challenge, this project developed a portable, smartphone-based retinal imaging device integrated with AI for automated screening. The system uses a 28-diopter condensing lens to capture high-resolution retinal (fundus) images, supported by a custom 3D-printed mount that stabilizes and aligns the smartphone during imaging. Captured images are processed through a mobile application that applies AI-based image analysis to detect pathological indicators of DR, such as swollen or irregular retinal blood vessels. The algorithm classifies images as either normal or abnormal, providing rapid point-of-care screening results. By combining low-cost optical hardware with automated analysis, this device aims to expand access to early DR detection in both high- and low-resource healthcare settings, reducing preventable vision loss.

TEAM MEMBERS
Tanner Cellio (BME)
Adam Gulan (BME)
Grant Glorioso (BME)
Alexander Lamb (BME)

FACULTY ADVISOR
Dr. Charles Tritt

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MSOE alumnus Mr. Bob Radke

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AI-Driven Wearable Stress Detection System

In classrooms every day, students experience rising stress that often goes unnoticed until it turns into disruption. This impacts not only their learning but the entire environment around them. This project aims to change this by developing an AI-driven wearable system designed to help adolescents manage stress and emotional dysregulation in classroom environments. The system uses physiological signals including heart rate (PPG), electrodermal activity (EDA), skin temperature, and motion data to detect early signs of stress. A machine learning model was created and trained on custom real-world and clinical datasets. The model analyzes each user's unique baseline and identifies subtle deviations to identify rising stress levels before they escalate into disruptive behaviors. The device then provides real-time, personalized coping strategies through a discreet feedback mechanism. This system supports self-regulation, reduces classroom disruptions, and assists teachers in maintaining a productive learning environment.

TEAM MEMBERS
Assiatou Bah (EE)
Mai Nguyen (EE)
Ousmane Nikiema (EE)
Ethan Whyte (EE)

FACULTY ADVISOR
Dr. Cory Prust

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AI Underwater Plastic Debris Detection System

The Underwater Plastic Debris Detection System identifies submerged plastic waste in freshwater environments to support environmental cleanup and monitoring efforts. Engineered to integrate seamlessly with commercial remotely operated vehicles (ROVs) and autonomous underwater vehicles (AUVs), it provides real-time detection to improve collection efficiency. To maximize portability and battery life, the system utilizes a highly efficient, custom dual-processor architecture. A low-power embedded microcontroller continuously monitors an acoustic sensor array for initial object detection. Upon sensing an object, it sends a hardware wake-up signal to an edge computing module, activating a custom-trained AI vision model. This model rapidly processes live camera feeds to classify and tag debris for collection.

TEAM MEMBERS
Sean Arneson (EE)
Jack Bauer (EE)
Chase Gattuso (EE)
Matthew Schaber (EE)

FACULTY ADVISOR
Dr. Kerry Widder

SPONSORS
Eric Arneson
Field Theory Consulting
MSOE alumnus Mr. Bob Radke

Automated Kayak

A problem faced by fishermen using kayaks is a lack of affordable options for aiding in hands-free positioning, navigation and course-correction to counter wind and wake conditions that easily push a kayak off its intended course. Our solution is an automated kayak that will hold its position and heading when stationary or maintain a constant speed and direction when traveling. The automated kayak system is powered by an 18 V battery which drives four motors positioned on all four corners of the kayak. A global positioning system (GPS) provides real-time position data to the system, while sonar and radar subsystems provide information about surrounding obstacles both above and below the water. The kayak can be controlled through the user's phone via a Wi-Fi connection to an ESP32. An STM32 microcontroller reads all this input data and controls the motors, positioning the kayaker for an enjoyable fishing experience.

TEAM MEMBERS
Andrew Briggs (BME)
William Fulay (BME)
Radhika Pawar (BME)

FACULTY ADVISOR
Dr. Sayed Ahmed

Automated Physical Therapy Clinical Note System

This project addresses inefficiencies in current physical therapy documentation processes that reduce patient interaction time and increase administrative burden. The Automated Physical Therapy Clinical Note System is a HIPAA-compliant documentation platform designed specifically for physical therapists. The system integrates AI-powered voice-to-text transcription with structured Subjective, Objective, Assessment, and Plan (SOAP) note templates to streamline clinical documentation. By enabling real-time note generation during patient sessions, the platform reduces manual data entry and improves workflow efficiency. The software has been developed and evaluated to ensure accuracy, usability, and compliance with healthcare privacy standards. This system aims to enhance therapist productivity while allowing clinicians to focus on patient care and engagement.

TEAM MEMBERS
Anthony Carli (EE)
Paige Kieselburg (EE)
Kyle Mathes (EE)
Noah Trevino (EE)

FACULTY ADVISOR
Dr. Luke Weber

SPONSORS
Field Theory Consulting
MSOE alumnus Mr. Bob Radke

Automated Safety Belt Release System

This project develops an automated safety belt-release system designed to free vehicle occupants during life-threatening emergencies when the standard buckle cannot be accessed or fails to operate. In severe crashes, rollovers, submersion events, or vehicle fires, safety belt can become jammed, increasing the risk of serious injury or death. Unlike manual safety belt cutters, which require the occupant to be conscious and capable or rely on third-party assistance, this system activates automatically when dangerous conditions are detected. The system integrates a high-g accelerometer, a sealed-port water pressure sensor, and a temperature sensor. Sensor data is processed by a microcontroller that evaluates thresholds to prevent false activations during normal driving. When validated, a high-force linear actuator drives a protected blade through the safety belt webbing in under four seconds. Visual and audible indicators provide status feedback, and a manual override ensures user control. Powered by a dedicated 12-volt battery, the system is self-contained and reliable.

TEAM MEMBERS
Paul Eickhoff (EE)
Ross Janis (EE)
Thomas Mann (EE)

FACULTY ADVISOR
Dr. Kerry Widder

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MSOE alumnus Mr. Bob Radke

Buck Wild Collar

Wildlife researchers utilize collars to collect long-term data on animal behavior and migration patterns. Yet, in studies lasting multiple years, these collars are prone to falling off or breaking due when the neck size of an animal changes over time. Our product aims to fill this gap through an adjustable mechanism that automatically grows and shrinks the collar to reflect the animals' neck circumference. It also includes standard collar features such as GPS, orientation, temperature, and tightness, which can be transmitted to an external website for data collection.

TEAM MEMBERS
Cade Andrae (CE)
Logan Etherington (EE)
Victor Martinez Lazaro (EE)
Kruger “Mac” Williams (CE)

FACULTY ADVISOR
Gerald Nagel

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The Buddy System

The Buddy System is a low-cost hiking tracker system focusing on user privacy and safety. The Buddy System consists of multiple devices all communicating via an encrypted private Long Range WiFi Network (LoRa) providing users with the power to navigate members of their party over large distances. Each device is paired with a LoRa radio, a display, an altimeter, magnetometer, GPS, and siren. This combination of low-power components gives the devices week-long plus battery life and the ability to consistently locate and notify members of hiking parties no matter the trip. The devices come paired with a custom phone application for group device setup which programs the devices over NFC, making device configuration simple, quick, and consistent. Put together, The Buddy System provides the reassurance of safety hikers look for without the subscriptions, privacy implications, and configuration difficulty of current market solutions.

TEAM MEMBERS
Joseph Barganz (CE, CS)
Jack Ford (SE)
Nash Piegl (CE)
Ian Roddick (CE)
Zachary Weidner (CE)

FACULTY ADVISOR
Dr. Darrin Rothe

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CANiac Duo

Controller Area Network (CAN) is widely used for communication between systems in modern vehicles. CAN may be troublesome to access and complicated to debug. The CANiac Duo is a device which aims to improve the accessibility of CAN troubleshooting, allowing users with limited technical expertise to debug and view the activity of a CAN network. The CANiac Duo allows users to monitor the traffic of two networks simultaneously, as well as bridge these networks. The user connects to the CANiac Duo’s web dashboard with a laptop or PC running a standard web browser. The web dashboard can be used to interact with the connected CAN network via message injection and view real time representations of the data present on the network.

TEAM MEMBERS
Hasan Dakak (EE)
Cerina Jossart (EE)
Payton Molenda (EE)
Aagam Shah (EE)

FACULTY ADVISOR
Dr. Luke Weber

CHAP32 Music Synthesizer

The CHAP32 Music Synthesizer is a modular synthesizer composed of multiple integrated subsystems including the audio output, keyboard input, user interface, audio effects, and the oscillator core with banana jacks for signal routing. Each subsystem throughout this device ensures proper electrical performance, signal integrity, and functional reliability prior to full system integration. This synthesizer supports real-time audio generation and processing, including effects such as phasing and distortion while maintaining correct power rails and low noise leakage. User interaction is enabled within this device through a capacitive touch keyboard with visual LED feedback, and a display interface for control and monitoring. Altogether, this device is a fully functional and reliable synthesizer capable of producing high quality audio output while allowing user control and signal processing capabilities.

TEAM MEMBERS
Yannik Marquardt (EE)
Samuel Salazar (EE)
Nathan Seefeld (EE)
Tiffany Trizna (EE)
John Wolf (EE)

FACULTY ADVISOR
Dr. Cory Prust

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Energy Harvesting Rectenna

Internet of Things (IoT) sensors often require reliable, long-term power in locations where wired power or frequent maintenance is impractical. As these devices become more prominent, the demand for sensors capable of operating without human intervention increases. This project presents a proof-of-concept rectifying antenna (rectenna) system designed to harvest energy from ambient RF sources. The system uses two antenna arrays operating in the 915 MHz and 2.4 GHz Industrial, Scientific, and Medical (ISM) bands, which host technologies such as LoRa, Zigbee, Wi-Fi, and Bluetooth. Each antenna feeds an RF-to-DC rectifier, and the resulting power is combined and routed into a power management circuit. A boost converter stabilizes the voltage, before the energy is stored in a supercapacitor. This solution reduces battery replacement while using RF energy that is otherwise wasted.

TEAM MEMBERS
Brock Adams (CE)
Bryant Bobadilla-Torres (CE)
Marlowe Fulton (CE)
Alexander Pedd (CE)
Tyler Salinas (CE)

FACULTY ADVISOR
Dr. Darrin Rothe

SPONSORS
Gary Gavin '02
Director of Engineering at JCI

Fusion Zero

Fusion Zero is an environmental monitoring system designed to measure and display key indoor environmental conditions in real time. The device consists of two separate modules, a ceiling module and a wall module, and uses multiple sensors to collect data including temperature, humidity, volatile organic compounds (VOCs), particulate matter, ambient light, sound level, and room occupancy using a millimeter-wave sensor. The collected data is processed by the system and transmitted over Wi-Fi using the MQTT protocol to a dashboard where users can view the information remotely. A local display also provides quick visual feedback on environmental conditions within the monitored space. The intended outcome of the project is to help provide students with a healthier and more comfortable learning environment while also supporting efforts to make classrooms more energy efficient.

TEAM MEMBERS
Matt Anderson (CE)
Alexi Castellanos (CE)
Hai Dinh (CE)
Kamilla Errigo (CE)
Adrianne Schellinger (SE)

FACULTY ADVISOR
Dr. Robert Turney

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Job Tracking Barcode Scanner

On large construction jobsites with many workers and tools, mistakes such as incorrect tool settings, lost equipment, and absence of progress tracking often cause delays and reduced productivity. Our solution is a handheld barcode scanner that communicates with smart tools and a central database to facilitate jobsite efficiency and organization. A user of this system begins by scanning their identification badge to sign in, and a Wi-Fi code to connect to the server. Then, after a fastener and material barcode are scanned, the system automatically starts tracking activity, logging tool usage, and adjusting tool settings to match the task, removing required manual setup and record keeping. This system demonstrates a practical way to reduce human error, improve workflow consistency, and offer supervisors clearer insight into job progress.

TEAM MEMBERS
Duaa Aljalous (SE)
Caleb Beddes (CE)
Jake Dahlgren (CE)
Caitlyn Grant (CE)
Andrew Schuman (CE)

FACULTY ADVISOR
Dr. Darrin Rothe

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MSOE alumnus Mr. Bob Radke

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OmniSync

OmniSync: A Portable, Versatile Surround Sound System

OmniSync is a self-contained, battery-powered device that enables anyone to transform ordinary Bluetooth speakers into a synchronized surround sound system. Designed for portability and ease of use, the device allows multiple speakers to connect and play audio simultaneously without requiring Wi-Fi, proprietary apps, or complex setup—users simply tap and connect. A rechargeable battery powers the device, making it ideal for portable environments such as outdoor gatherings, parties, or home theater setups. OmniSync can also synchronize audio across multiple headphones, enabling shared yet quiet listening experiences. The built-in touchscreen interface allows users to configure speaker connections, adjust volume levels, and arrange surround sound placement in real time. Previously paired devices are stored in memory, enabling automatic reconnection on startup and reducing setup time for repeated use. By combining custom hardware design, embedded systems programming, and wireless audio technologies, OmniSync provides a flexible and accessible solution for creating immersive audio experiences anywhere.

TEAM MEMBERS
Jason Gerding (CE)
Travis Jankowski (CS)
Alexander Lopez (SE)
Patrick Rafferty (CS)
Sam Schneider (CE)
Gabrielle Sladek (UX)

FACULTY ADVISOR
Dr. Robert Turney

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PIDgen

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PIDgen

PIDgen is a portable system that automates PID tuning for hydro turbine generator governors and excitation systems. It uses reinforcement learning plus a Simulink based simulation environment to propose P, I, and D gains for off-line and on-line operating modes. The device includes a web-based HMI for configuration, monitoring, and approval of parameter changes, plus hardware IO to interface with plant controls. PIDgen logs tuning actions and results to support auditing and repeatable commissioning. The goal is to cut tuning time and reduce reliance on scarce expert judgment, while improving efficiency, reliability, and grid stability.

TEAM MEMBERS
Anish Kusukuntla (CE)
Taylor Lewein (CE)
Mohan Li (CE)
Andrew Lizak (CE)
Lukas Schmidt (CE)

FACULTY ADVISOR
Dr. Darrin Rothe

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MSOE alumnus Mr. Bob Radke

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Pill-Pal Medication Dispensing System

The Pill-Pal is a device that automatically dispenses pills for users, intended for people with complicated medication schedules or older patients that are more likely to struggle with keeping a routine. Custom pill bottles are filled and prepared with medication at the pharmacy, where they can be supplied to the user. Prescription information is labeled on the bottles, which is transferred by a QR code that can be scanned by the device to easily program the prescription's schedule. The system uses motors, sensors, and non-volatile memory to dispense and track up to five different medications. The Pill-Pal also integrates a speaker, LCD screen, and an LED Light to be able to provide audio, visual, and instructional alerts and error messages. With the Pill-Pal you are sure to never miss a dose.

TEAM MEMBERS
Josephine Dobbs (BME)
Parker Femal (BME)
Josephine Jacklin (BME)
Ella Kwaterski (BME)

FACULTY ADVISOR
Dr. Charles Tritt

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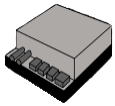
Posterior Walker for an Active Lifestyle

Current posterior walkers on the market are not designed to meet the complex and dynamic needs of adolescent users. Existing designs lack the versatility, independence-promoting features, and durability required for an active, ever-changing teenage lifestyle. Our posterior walker will address these needs by building upon the functionality of previous posterior walkers and adding additional features to support sport-specific upper body motions, providing essential practical attachments for carrying items and incorporating multi-terrain wheels necessary for outdoor mobility. These additional features should accomplish the goal of increasing user quality of life through adolescent years where previously they may have felt unsupported. The team worked to engineer new designs for the frame, handles, seat, wheels, and a carrying tray to accomplish the set goals of increased user independence and activity.

TEAM MEMBERS
Cameron Bodie (CE)
Dixon Liang (EE)
David Litton (SE)
Robert Meyers Jr. (CE)
Preston Tran (CE)

FACULTY ADVISOR
Dr. Robert Turney

SPONSORS
Field Theory Consulting
MSOE alumnus Mr. Bob Radke



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Remote Data Acquisition (RDAQ)

The Remote Data Acquisition (RDAQ) device is a portable, multi-functional tool designed to streamline development and testing in the embedded engineering industry. The RDAQ addresses the current market's lack of automated, real-time logging tools by offering a single solution that simultaneously monitors analog signals, temperature, and various digital communication protocols like I2C, SPI, and UART. The RDAQ is battery-powered and compact, featuring Wi-Fi connectivity that enables remote data access via a web interface. By automating data collection and supporting centralized logging for multiple devices, the RDAQ eliminates the need for constant physical monitoring and expensive, specialized equipment. Ultimately, the project aims to increase engineering efficiency, reduce measuring tool costs, and allow teams to focus on revenue-building activities rather than manual data oversight.

TEAM MEMBERS
Kolby Dax (CE)
Benjamin Himmel (CE)
Vincent Lee (CE)
Kailey Petray(CE)
Jesse Propst (CE)

FACULTY ADVISOR
Dr. Robert Turney

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RFID Attendance Tracker

The RFID Attendance Tracker provides a fast, reliable, and secure system for tracking attendance in both academic and professional settings. The system takes advantage of the fact that most schools/workplaces utilize RFID cards for identification by automating attendance recording, allowing students or employees to log their presence simply by scanning their RFID cards, and thereby minimizing disruption to class or work time. Each scan will record the exact date and time of a scan, and users will receive real-time feedback through visual LED indicators and audio signals. Instructors can monitor attendance through a modern web interface instead of relying solely on a traditional LCD display. Attendance data will be transmitted securely to a cloud-hosted database enabling students, professors, and administrators to export and analyze records. They may also monitor trends such as late arrivals or participation patterns, allowing professors and administrators to easily make informed grading or intervention decisions.

TEAM MEMBERS
Brady Berghauer (ME)
Tristan Hulebaus (EE)
Caden Kautza (EE)
Zachary Pflanzer (ME)
Eli Seitz (EE)

FACULTY ADVISOR
Lucas Garcia

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Rite-Hite End-of-Line (EOL) Text Fixture

The Rite-Hite End-of-Line (EOL) Test Fixture is an automated, electromechanical testing system designed to verify the hardware functionality of the Rite-Hite Connect Module™ PCBA at the end of the production process. Currently, manufacturing technicians rely on inefficient, error-prone manual switch boxes. This project replaces that method with a custom, high-precision fixture centered around an STM32U575 microcontroller and a touchscreen interface. The system automatically stimulates the Device Under Test (DUT) with industrial-grade signals including +24V digital inputs, 0-10V analog ramps, and 4-20mA current loops while simultaneously monitoring open-drain and relay output responses. Physical interaction is achieved through a custom "Bed of Nails" pogo-pin interface and solenoid-driven actuators that physically depress onboard buttons. By completely automating the testing sequence, this fixture significantly enhances manufacturing speed, ensures consistent quality control, guarantees operator safety, and provides reliable data logging.

TEAM MEMBERS
Lisa Butargabe (BME)
Zach Peterson (BME)
Ben Williams (BME)

FACULTY ADVISOR
Dr. Ahmed Sayed

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MSOE alumnus Mr. Bob Radke

Sensory-Enhanced Myoelectric Prosthesis

Our team developed a sensory-enhanced transradial myoelectric prosthesis integrating vibrotactile and proprioceptive feedback into a 3D-printed, cable-driven hand. Surface EMG signals control six servo motors that move the fingers and thumb. An auxiliary flex sensor system simulates advanced EMG control during testing. Fingertip and palm pressure sensors drive cuff vibration motors to convey grip force. Skin-stretch rollers above the elbow provide proprioceptive feedback on hand aperture. Users adjust or disable feedback through a simple onboard interface. The system is powered by a rechargeable lithium-polymer battery. The prosthesis was tested to demonstrate compliance with critical product design specifications.

TEAM MEMBERS
Brandon Istad (EE)
Dmytrii Kutsiianov (EE)
Bart Maciol (EE)
Noah Menting (EE)
Carter Ulmer (EE)

FACULTY ADVISOR
Dr. Kerry Widder

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MSOE alumnus Mr. Bob Radke

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Smart Parking Lot Assistant Robot

Presenting the autonomous Smart Parking Lot Assistant Robot, which is intended to make parking quicker, simpler, and less annoying for users. The robot patrols parking lots, uses real-time AI image processing to identify open and occupied spaces, and updates a live availability map that users can view on their phones prior to arriving. The project was developed in response to an existing issue in parking lots: drivers waste time and gasoline looking for open spaces, causing needless traffic. This robot offers a more adaptable and economical solution without requiring any modifications to the parking lot itself, in contrast to traditional parking monitoring systems that rely on fixed sensors, wiring, and other long-term infrastructure changes. Universities and event planners can use it because of their scalability and portability. Overall, the Smart Parking Lot Assistant Robot is meant to improve parking efficiency, reduce stress, and lower unnecessary fuel consumption.

TEAM MEMBERS
Derek Achen (BME)
Steven Hutton (BME)
Peter Wall (BME)

FACULTY ADVISOR
Dr. Charles Tritt

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Field Theory Consulting
MSOE alumnus Mr. Bob Radke

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Smart Tourniquet

Conventional portable tourniquets rely on manual tightening in stressful situations, which can lead to insufficient bleeding control or excessive pressure—risking unintended nerve and tissue damage. The Smart Tourniquet is an automated hemorrhage control device designed to improve the safety and reliability of limb tourniquet application. The system integrates Doppler ultrasound sensing to monitor arterial blood flow and determine when effective occlusion has been achieved. Using a closed-loop control system, the device dynamically adjusts cuff pressure in response to this real-time physiological measurement, helping prevent both under-tightening and excessive compression. By combining automated pressure regulation with physiological feedback, the Smart Tourniquet reduces user error while improving hemorrhage management in emergency situations. The device is intended to support armed service members, first responders, medical personnel, and untrained users by providing a safer and more consistent method of tourniquet application, ultimately improving outcomes for patients experiencing life-threatening limb injuries.

TEAM MEMBERS
Celida Anaya (BME)
Alfredo Aranda (BME)
Christopher Guenter (BME)
Adrian Lopez (BME)

FACULTY ADVISOR
Dr. Ahmed Sayed

SPONSORS
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MSOE alumnus Mr. Bob Radke
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Tremor Compensating Eating Utensil

Millions of individuals living with neurological conditions such as Parkinson's disease and essential tremor have trouble performing everyday tasks like eating due to involuntary hand movements. This project developed an actively stabilized eating utensil designed to reduce the effects of tremors and help users maintain independence during meals. The device uses an inertial measurement unit to detect hand motion and tremor patterns in real time. A microcontroller processes data and commands servo motors to counteract undesired motion, stabilizing the utensil head and helping keep food level while eating. The system was designed to be lightweight, ergonomic, and easy to clean for everyday use. Electronics and a rechargeable battery are integrated within the handle to create a compact assistive device. Through iterative prototyping and testing, the project demonstrates how integrating biomedical, electrical, and mechanical engineering can produce a practical technology that improves quality of life for individuals affected by hand tremors.

TEAM MEMBERS
Kyle Hekkers (EE)
Jarryd Helfrich (EE)
Colin Iverson (EE)
Ryan McDonald (EE)

FACULTY ADVISOR
Dr. Luke Weber

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MSOE alumnus Mr. Bob Radke

SPLUNCR

Project SPLUNCR has the goal of designing and building a low-cost remote operated vehicle (ROV) system specifically tailored to search and rescue operations within confined environments such as flooded caves or mines. The project leverages emerging manufacturing technologies, such as 3D-printing, in order to minimize costs in key areas. An in-house built thruster system was created for this project, utilizing commonly available RC electronic speed controllers, brushless DC motors, and lithium-ion batteries. This combined with 3D-printed housings and impellers allowed for a capable, but low-cost propulsion system. Commercially available acrylic tubing was machined to create the pressure vessels of the ROV, combined with off-the-shelf hardware for the watertight bulkheads. The electronics system makes use of the Raspberry Pi 3b for handling the communications and controls system.

TEAM MEMBERS
Robert Erickson (EE)
Porter Hasz (EE)
Mateo Mascarette (EE)
Daniel Reed (EE)

FACULTY ADVISORS
Dr. Luke Webber
Dr. Kerry Widder
Dr. Jay Wierer

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Trip Sense

The Trip Sense product is a current-monitoring system intended to monitor a house or apartment breaker box for residential use. This product uses a microcontroller through an I2C peripheral interface to read currents flowing through circuit breakers. These currents are read using clamp current transformers around the line and neutrals of the measured breakers. The microcontroller analyzes and shows the currents on a front display. This analysis includes determining if a ground fault has occurred within one of the monitored circuits.

TEAM MEMBERS
Ethan Davison (EE)
Addie Kortman (EE)
Drew Rippl (EE)
Nate Schmidt (EE)
Gabrielle Tully (EE)

FACULTY ADVISOR
Dr. Cory Prust

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Vibration Sensing for OLTC

On-Load Tap Changers (OLTC) are a critical component in the energy grid, changing the outputting load on the transformer. With such a critical system, monitoring the health of the OLTC is a must to prevent breakdown. Our project aims to use the vibration waves produced by the OLTC to assist in spotting failing parts as early as possible. The system utilizes a vibration sensor that feeds the vibration wave into a conditioning circuit to provide the embedded system with clean data to run calculations. The embedded board runs the wave data through an analog to digital converter (ADC) so that a fast Fourier transform (FFT) can be used to analyze the spectral characteristics of the vibration signal. The results are then compared to a healthy waveform, and any irregularities are reported to an output screen.

Rader School of Business

Rader School of Business Senior Projects

STUDENT NAME
Jacob Bosse
B.S. Finance

FACULTY ADVISOR
Dr. Kenneth Dobbs

COMPANY NAME
BMO N.A. Bank

BMO N.A. Bank Acquisition of U.S. Regional Bank

Bank of Montreal is a Canadian financial institution that has expanded its geographic footprint over the last few decades by incorporating key bank products in the United States, including commercial banking, wealth management, capital markets, and personal banking and retail solutions. This project aims to evaluate a potential merger and acquisition scenario in which BMO would acquire a U.S.-based bank. The research will study BMO's current market position and strategic vision using Ansoff's matrix, identify geographic regions of interest with positive economic growth indicators, analyze cultural and management synergies between the acquirer (BMO) and the acquiree, and develop strategic financial models for the purpose of valuing a U.S. regional bank. This project intents to diversify BMO's current deposit base and increase its market share across the North American banking industry by consolidating new branches and customers.

STUDENT NAME
Lauren Chyla
B.S. Marketing

FACULTY ADVISOR
Dr. Michael Payne

COMPANY NAME
Rockwell Automation

Improving Answer Engine Optimization at Rockwell Automation

This project focuses on providing a recommendation to Rockwell Automation on how to improve their Answer Engine Optimization (AEO). This project will provide a clear strategy for how to improve Rockwell's AI search rankings and frequency in their automotive, food and beverage, and brand marketing campaigns. This strategy will be supported by research on AI engine algorithms, prompt/question analysis, and competitive analysis.

STUDENT NAME
Yacine Ferjani
B.S. Finance

FACULTY ADVISOR
Dr. Kenneth Dobbs

COMPANY NAME
Strattec Security Corporation

STRATTEC Financial Analytics Dashboard

This capstone project develops an interactive Power BI dashboard that unifies STRATTEC Security Corporation's historical financial data across business units, product types, and product categories. The project transforms fragmented financial records into a structured, validated dataset and visualizes key metrics including revenue, COGS, gross margin, operating costs, and profitability ratios to support clearer managerial assessment. By integrating dynamic filters, drill down capabilities, and standardized financial definitions, the dashboard enhances visibility into cost drivers, segment performance, and multi year trends. The work addresses the company's current limitations in cross unit comparison and manual financial analysis, providing a consistent, organization wide view of historical performance. This solution strengthens data driven decision making while remaining focused on descriptive analytics rather than forecasting or real time integration.

STUDENT NAME
Hendrik Fischer
B.S. Management
B.S. Business Administration and Engineering

FACULTY ADVISORS
Dr. Trina Moskalik
Dr. Rainer Lehmann

COMPANY NAME
Palermo's Villa Inc.

Analyzing and Optimizing Warehouse Processes to Improve Material Supply at Production Lines

Palermo's Villa Inc. has the problem that production lines experience material-related downtime after changeovers because required materials are not always at the point of use. This project focuses on internal warehouse processes that determine material readiness and analyzes the material movement workflow triggered by changeover notifications. The scope includes picking and replenishment execution, request prioritization, staging practices, and how the warehouse layout affects travel and searching time. In addition, the project reviews the cross-departmental communication between warehouse administration and production that influences information quality and timing. The analysis aims to identify key drivers of delayed or incorrect material supply, such as layout constraints, process variability across shifts, and inconsistent prioritization. The outcome is set to provide implementable improvements including standardizations of work, slotting/zoning adjustments, and mistake-proofing measures.

STUDENT NAME
Reagan Gill
B.S. Marketing

FACULTY ADVISOR
Dr. Michael Payne

COMPANY NAME
Rader School of Business at Milwaukee School of Engineering

From Awareness to Declaration: Increasing Business Minor Enrollment at MSOE

This capstone project aimed to analyze and improve the student journey for declaring Rader School of Business minors at MSOE. By using the historical data on the business minors declared provided, I assessed the trends over time broken down by majors, and other key segments. This project also included semi-structured interviews and discussions with internal and external stakeholders alike, for example, RSOB's faculty and advisors and the professional advisors to understand how both the existence and importance of the minors are communicated. Research was conducted on both MSOE's and other universities' minor structures and promotion tactics to identify the best practices. Through continual identification of data-driven barriers, misconceptions, and motivators at each stage of the process, biases were excluded entirely. By using these inputs, this project developed data-driven and operationally feasible strategies to increase the number of declared RSOB minors over the next few academic years with implementation-ready recommendations for RSOB leadership.

STUDENT NAME
Steve (Sihong) Guo
B.S. Finance

FACULTY ADVISOR
Dr. Kenneth Dobbs

COMPANY NAME
Huayuan Securities Co., Ltd

Comprehensive Sector Analysis of AI Data Center Infrastructure Companies

In recent years, the demand for AI data centers has been increasing drastically. This project is designed to perform comprehensive company analysis on potential AI infrastructure companies that Huayuan Securities wants to get more information on. Huayuan Securities is a Chinese investment firm and is looking to expand their equity research over in North America. The company wants to use this project to provide them with insights and information on AI infrastructure companies with high potential. Throughout the analysis, standard valuation and financial modeling methods will be used combined with company level research. The analysis of each potential company will include their market positioning, competitive strategies, and future contracts that might help companies to expand in the AI industry. Additional deliverables will include an overall report on the AI data infrastructure industry.

STUDENT NAME
Marelyn Hyland-Rodriguez
B.S. Marketing

FACULTY ADVISOR
Dr. Michael Payne

COMPANY NAME
El Rey Plaza Inc.

Developing an Effective Training Program for Grocery Back Office Software at El Rey Plaza

Over a six-month period, my project focuses on optimizing the use of BR Data, the Back Office Software at El Rey Plaza. I will conduct a functional analysis of the system to identify underutilized features related to inventory management, invoice processing, SKU maintenance, and pricing controls. This includes making item setup more efficient, removing outdated SKUs, and using reports to make better business decisions. Based on these findings, I will design and implement a structured training program for employees responsible for ordering, invoicing, and price management. The training will transition staff from manual processes to standardized digital workflows within BR Data. Post-implementation, I will evaluate system adoption, error rates, and report utilization to measure effectiveness. Project success will be determined by increased software usage, reduced data-entry errors, improved inventory accuracy, and decreased reliance on manual tracking methods.

STUDENT NAME
Jeffrey Kalma
B.S. Operations and Systems Management

FACULTY ADVISOR
Dr. David Rollins

COMPANY NAME
Milwaukee School of Engineering Mechanical Engineering Department

Designing a Sustainable Knowledge Transfer System for the Mechanical Engineering Rapid Prototyping Center

This project addresses the risk of losing critical additive manufacturing capabilities in the MSOE Mechanical Engineering Rapid Prototyping Center (ME RPC) as student experts graduate. The lab currently relies on undocumented tribal knowledge to operate SLS (Selective Laser Sintering) and 3D scanning equipment. This threatens support for senior design projects and core mechanical engineering courses. The work began with interviews and observations to capture operational knowledge, followed by the creation of a map of the current onboarding and print workflows. Using knowledge management and Lean Standard Work concepts, a troubleshooting guide, and a structured documentation repository. A formal onboarding and governance process is implemented to ensure that future student workers can operate the equipment safely and consistently. The result is designed to preserve the ME RPC capabilities and reduce the steep learning curve for new student workers.

STUDENT NAME
Mohamad Khatib
B.S. Operations and Systems Management

FACULTY ADVISOR
Dr. David Rollins

COMPANY NAME
Rader School of Business at Milwaukee School of Engineering

Streamlining the RSOB Assessment Process

Since 2022, RSOB has maintained a systematic undergraduate evaluation strategy to comply with MSOE CLOs and ACBSP programmatic accreditation standards. This data is specifically being used by RSOB to guarantee that students possess basic principles, abilities, and to continuously promote ongoing academic improvement. This project concentrates on analyzing the obstacles along with evaluating potential tools, methodologies, and improving the assessment process to guarantee that RSOB satisfies the criteria of both the ACBSP and HLC.

STUDENT NAME
Linus Ludwig
B.S. Management
B.S. Business Administration and Engineering

FACULTY ADVISORS
Dr. Trina Moskalik
Dr. Rainer Lehmann

COMPANY NAME
Hydro-Thermal

Business process mapping and quantitative analysis of core processes at Hydro-Thermal

This project aims to optimize the documentation and visualization of processes within Hydro-Thermal Corporation. Business process mapping refers to a visual, step-by-step representation of workflows, using tools such as SIPOC diagrams or BPMN 2.0 swimlane flowcharts. By applying interview-based questions from ISO 9001 to identify and define processes, it is important to highlight where bottlenecks occur, where efficiency can be improved, and to establish Key Performance Indicators (KPIs) for each process. In addition to process maps, a key project outcome is a concept for implementing these KPIs in the Enterprise Resource Planning (ERP) system. The project is limited to identifying and mapping processes in departments such as Customer Support, Sales, Engineering, and Production.

STUDENT NAME
Camden Nennig
B.S. Finance

FACULTY ADVISOR
Dr. Kenneth Dobbs

COMPANY NAME
West Bend Insurance Company

Small Market Policy Retention Analysis

West Bend Insurance is an insurance provider located in West Bend, Wisconsin. They specialize in property and casualty insurance but also provide personal lines options. This project focuses on the small market policies that the company issues. These policies have a premium band that ranges from $1 to 25,000. This group is experiencing a monthly loss of around 15%, which equals 500-700 accounts leaving either before or after renewal. The goal of this project is to analyze the reasons why these accounts are leaving. Using Customer Segmentation, the Kano Method, and other various financial metrics, the goal is to provide suggestions for creating a better policy for these small businesses, improving relationships, retention, and profitability.

STUDENT NAME
Marc Robering
B.S. Management
B.S. Business Administration and Engineering

FACULTY ADVISORS
Dr. Trina Moskalik
Dr. Rainer Lehmann

COMPANY NAME
Jorgensen Conveyors and Filtration Solutions (JCFS)

Analysis of Production Line Efficiency and Constraint assessment in an Engineer-to-Order Manufacturing Environment

This project was conducted in the manufacturing engineering department at Jorgensen Conveyor and Filtration Solutions, an engineer-to-order manufacturer of customized conveyor systems. The objective was to assess an assumed bottleneck in the belt assembly process and evaluate inefficiencies across production line one. Due to the lack of structured process documentation and performance transparency, the production system was analyzed as an interconnected process rather than isolated workstations. The project included process mapping, analysis of recorded production times, and evaluation of material and information flow. Potential constraints and inefficiencies were identified and assessed using a systematic, data-driven approach. Based on the findings, root cause analyses were performed, and improvement recommendations were developed to support informed management decision-making and future process optimization initiatives.

STUDENT NAME
Luca Wedemeyer
B.S. Management
B.S. Business Administration and Engineering

FACULTY ADVISORS
Dr. Trina Moskalik
Dr. Rainer Lehmann

COMPANY NAME
HellermannTyton North America (HTNA)

HellermannTyton

Improvement of decision-making processes at HellermannTyton North America

HellermannTyton is a leading, global operating company that provides cable management solutions. HTNA faces reoccurring difficulties in the decision-making process for internal projects due to a lack of standards. Problems often begin in the early phase of a project when the opportunity to define evaluation criteria and success factors is missed. This leads to bigger challenges as the project progresses.

This project focuses on developing a framework that will enable HTNA to make more strategic decisions. It explains the different kinds of decision making, their key differences as well as the most common biases to raise the awareness in future projects. During this project, a guideline will be developed to help for HTNA managers to choose the right decision-making tool for their projects and raise awareness of crucial factors right from the beginning.

STUDENT NAME
Jackson Yee
B.S. Finance

FACULTY ADVISOR
Dr. Kenneth Dobbs

COMPANY NAME
Sellars Absorbent Materials Inc.

SELLARS

Actual Cost Report and Customer/Product Prioritization

Sellars Absorbent Materials currently tracks their profitability and margins through Power BI using their standard cost metric instead of actual costs. Standard cost is defined as the predicted cost of materials and manufacturing under “normal” circumstances. Although actual cost is tracked internally, it is not a financial metric used to determine which companies and product lines drive the most value to the business. This project will support the creation of a Power BI profitability and gross margin report to compare standard and actual costs side by side. From there, metrics such as gross margin, gross profit, and variable margin will be combined with factors such as the types of products a customer orders, the volume of product a customer orders, and revenue from a customer to determine which products and customers are most valuable to Sellars Absorbent Materials.

STUDENT NAME
Ethan Crespo
B.S. Marketing

FACULTY ADVISOR
Dr. Michael Payne

COMPANY NAME
CRDN of Chicago

PPE Training Recommendation

This project focuses on improving CRDN's operations through the development of what PPE training would entail and why it is necessary for the company to be successful. The company specializes in restoration after a crisis such as fires, floods, and other hazards that may occur. Currently the company is limited to certain types of jobs due to the lack of PPE (personal protective equipment) and proper PPE training. This in turn can cause a loss of revenue and tarnish reputation and reliability as a company. The goal of this project is to create a guideline for what a training program would require in order to implement and why the training program is necessary. Included with this will be a new SOP (Standard operating procedure) that the company would in theory follow if they were to implement the training program so that it is followed correctly and tasks in the everyday job are safely and efficiently completed.

STUDENT NAME
Lexi Hicks
B.S. Management

FACULTY ADVISOR
Dr. Trina Moskalik

COMPANY NAME
Sabre Supply Inc.

Warehouse Optimization at Sabre Supply Inc.

This project will implement an online inventory management system. Currently, there is no formal inventory management system, which leads to inefficiencies when fulfilling orders and tracking inventory levels. The main objective of this project is to improve picking times and keep track of inventory going in and out of the warehouse in real time. A barcode system will be used to track inventory. Additionally, the warehouse will be reorganized to make picking times more efficient. Products that go out of the warehouse on a weekly basis will be placed near the dock to improve picking times. New standards will be established at Sabre Supply Inc. to ensure that the warehouse remains efficient with the new system.

STUDENT NAME
Carson Jones
B.S. Accounting

FACULTY ADVISOR
Dr. Kenneth Dobbs

COMPANY NAME
Cote Hospitality

Cote Hospitality Spend Per Guest Project

This project addresses a critical decline in ancillary revenue at Cote Hospitality two resorts, Grand View Lodge and Tanque Verde Ranch, specifically focusing on the Spa and Retail profit centers. The objective is to bridge the revenue gap by identifying underperforming service areas, running efficient promotions, and optimizing contribution margins.

STUDENT NAME
Jeffrey Kaas
B.S. Management

FACULTY ADVISOR
Dr. Trina Moskalik

COMPANY NAME
IFP Motion Solutions Inc

Achieving Operational Readiness for High-Volume Manifold Assembly at IFP Motion Solutions

This capstone project examines an operational readiness gap within the manifold assembly process at IFP Motion Solutions, Inc. Although the company has a mechanically completed multi-station hydraulic manifold assembly line intended for high-volume production, the line remains largely unused due to the absence of standardized processes, training documentation, and clearly defined operational procedures. The project analyzes the current manifold assembly workflow and identifies the operational elements required to run reliable production on the assembly line. The end goal is to enable repeatable operation of the assembly line, reduce assembly times for higher-volume orders, and to allow IFP to credibly demonstrate capability to its customers for larger manifold production orders.

STUDENT NAME
Jack Karges
B.S. Finance

FACULTY ADVISOR
Dr. Kenneth Dobbs

COMPANY NAME
International Institute of Wisconsin

Financial Process Improvement for a Small Nonprofit

The International Institute of Wisconsin (IIW) is a nonprofit organization that provides immigration services for refugees and immigrants with complex funding streams from government grant-funded programs, donations, and other various revenue sources. Despite this complexity in funding, the overall financial operation is managed by two employees who use a limited set of accounting and spreadsheet tools to organize their financial reporting, payroll, invoices, expenses, and cost allocation. This operation often relies on time-consuming manual effort and informal methods of documentation.

I will be providing an actuals-based fringe benefits allocation model, an active worksheet for standardized budgeting for consistent financial recording, and a comprehensive cost allocation analysis report. These deliverables together will improve the accuracy, consistency, and transparency of internal program-level financial reporting within their current software and department size.

STUDENT NAME
Reed Kelly
B.S. Operations and Systems Management

FACULTY ADVISOR
Dr. David Rollins

COMPANY NAME
Rock Road Companies

Concrete Expansion Feasibility Analysis

This project evaluates whether Rock Road Companies should vertically integrate concrete operations into their roadway construction services. The company currently performs asphalt paving, earthwork/grading, and underground storm sewer installation but subcontracts concrete work such as roadway paving, curb, and sidewalk installation. As a result, Rock Road is not fully integrated across the four primary phases of roadway construction. The project analyzes the financial, operational, and strategic feasibility of bringing concrete work in-house. Using established frameworks from operations management, strategy, and finance, the study assesses capital requirements, equipment investment, labor structure, and execution risk under a $3 million capital constraint. Financial modeling and operational analysis determine the conditions under which vertical integration could improve profitability, reduce subcontractor reliance, and increase project efficiency.

STUDENT NAME
Carter Mattek
B.S. Marketing

FACULTY ADVISOR
Dr. Michael Payne

COMPANY NAME
BriteStar Virtual Academy

BRITESTAR
CHRISTIAN VIRTUAL EDUCATION

Scalable Sales Framework for Market Expansion in Niche Markets

This project is based around the Market Expansion of Private Online School BriteStar as they expand their territory from Wisconsin into both Florida and Texas. Using the framework of the established 7 Steps of Selling, a repeatable Sales Playbook will be used to standardize the informal, person-dependent sales culture into a scalable, process-driven model.

Using the Sales Playbook will help to standardize both outreach and the process that BriteStar expects of their sales team, as well as reduce the time needed for new hires to begin efficient for sales practices for the company. To help standardize this sales process, an Ideal Customer Profile will be constructed to help identify the perfect customers in Florida and Texas for the sales team to reach. These tools will be put together to promote a smooth, standardized and efficient sales process as the company enters these new states.

STUDENT NAME
Simon Mezydlo
B.S. Operations and Systems Management

FACULTY ADVISOR
Dr. David Rollins

COMPANY NAME
Briggs & Stratton

BRIGGS & STRATTON

Optimizing Non-BOM Inventory Using a Two Bin Kanban System

This project utilizes the DMAIC framework to transition non-BOM supply management from a subjective, periodic review process to an objective, continuous review system. By applying Point of Use Storage theory, materials were relocated to packaging workstations, reducing "motion" waste and mitigating pedestrian safety risks in high traffic forklift zones. The technical foundation of the project relies on the Reorder Point formula to determine bin capacities based on average daily demand, lead times, and safety stock requirements. The implementation of a physical Two-Bin Kanban system provides a real time visual replenishment signal, eliminating "gut checking" ordering and reducing stockouts. This structured approach ensures a sustainable, self-diagnostic inventory flow that stabilizes supply levels and improves overall operator efficiency within the distribution center.

STUDENT NAME
Jeanette Munoz
B.S. Operations and Systems Management

FACULTY ADVISOR
Dr. David Rollins

COMPANY NAME
Engineering Pump Services

Efficient Layout Redesign

This project will focus on recommending a new design for the repair shop floor layout of Engineering pump services, a small company focusing on pump evaluation, inspections and repairs. With that the current layout faces a lack of standardized process flow, lack of inventory storage procedure and disorganization creating non-value movement. Researching lean methodologies and layout theories, a new layout recommendation will be developed to align repair stations and both tool and part inventory creating a unidirectional flow. The recommended layout aims to create a process flow while reducing the amount of non-value-added movement leading to a more efficient repair of a pump.

STUDENT NAME
Oliver Nehmer
B.S. Marketing

FACULTY ADVISOR
Dr. Michael Payne

COMPANY NAME
Glorioso's Italian Market

Improving Loyalty Program Awareness at Glorioso's

This project analyzed customer awareness at a local grocery store over a six-month period. The store had recently switched to a new loyalty program and was experiencing issues getting downloads. This project used theories to understand why customers were not interacting with the loyalty program as much as expected. Observational data was collected over several weeks to measure aspects of customer awareness. This data was then used to improve awareness methods and to find the best time to make customers aware. These methods were then tested again to ensure they were the best fit. Using these tested findings, recommendations were made to both increase interactions with the app and to help train employees in the best ways to interact with customers. This project demonstrates how small-scale research and data analysis can help local businesses better understand customer engagement.

STUDENT NAME
Spencer Northway
B.S. Operations and Systems Management

FACULTY ADVISOR
Dr. David Rollins

COMPANY NAME
Numotion

Supplier Performance Optimization

My senior capstone project concentrates on supply chain visibility issues at Numotion. These issues are the lack of a comprehensive supplier dashboard to find causes of reoccurring two-day delay notices on purchase orders, causing more issues downstream. The process to resolve this has required creating an excel prototype dashboard and a revised functional supplier scorecard to quantify Numotion's vendors performance. By using theoretical tools and methods such as Process Mapping, continuous improvement techniques, and many others to assist the projects development in analyzing key performance indicators (KPIs) and on-time delivery (OTD). Overall, the deliverables of this project aim to give Numotion's Supply Chain and Operations team actionable items such as the dashboard, supplier scorecard, and process maps to assist them in monitoring and identifying as well as giving recommendations in addressing performance issues and finding opportunities with their vendors.

STUDENT NAME
Mary Schwabe
B.S. Finance

FACULTY ADVISOR
Dr. Kenneth Dobbs

COMPANY NAME
Michels Corporation

Corporate Credit Card Spending Best Practiceand Recommendations

This project involves analyzing credit card transactions from the corporate employees' company credit cards to determine if there is any inappropriate spending. A graph will be provided to show the amount of inappropriate spending that is found and help give financial insight into the problems caused by unclear guidelines. A recommendation for the credit card policy that should be provided in the employee handbook will then be providedfor Human Resources to review.

STUDENT NAME
Sarina Vongsavath
B.S. Marketing

FACULTY ADVISOR
Dr. Michael Payne

COMPANY NAME
FreshFin

FreshFin

Pricing Strategy and Profit Margin Analysis for FreshFin

The project focuses on their two Milwaukee stores in Brookfield and Bayshore, where rising ingredient and supply costs have made it more challenging to consistently reach the company profit margin goal of 10-20%. This is done by evaluating pricing strategies at each store through competitor benchmarking, positioning analysis, and contribution margin calculations for FreshFin's top 3 proteins (salmon, tuna, and chicken) and two premium toppings (truffle crab salad and seaweed salad). Competitor benchmarking and positioning analysis includes comparing competitor price and portion sizes, and in-store observations. Contribution margin analysis is used to identify ingredient-level profitability and potential pricing adjustments. Based on these insights, location-specific pricing recommendations are presented that estimate increase profit margins with the goal of minimizing the risk of customers switching to competitors.

STUDENT NAME
Lennart Woltmann
B.S. Operations and Systems Management
B.S. Business Administration and Engineering

FACULTY ADVISORS
Dr. Trina Moskalik
Dr. Rainer Lehmann

COMPANY NAME
Alto-Shaam Inc.

ALTO-SHAAM

Evaluation and Improvement of Workplace Design and Process Efficiency in a Commercial Oven Assembly Environment

This project is conducted at Alto-Shaam Inc. within the Specialty Value Stream, where rotisserie and combi ovens for commercial kitchens are assembled. The current setup shows potential for improvement in workplace design, layout efficiency, and the consistency of daily execution. The project analyzes existing workstation conditions, materials, and operator flow to reduce non-value-adding activities such as searching, excessive walking, unnecessary handling, and rework.

The scope includes reviewing point-of-use organization for tools and parts, workplace standardization, staging and replenishment routines, visual management, and adherence to the 5S framework. In addition, the project evaluates how the current layout influences ergonomics and process variation.

STUDENT NAME
Adrian Woschick
B.S. Management
B.S. Business Administration and Engineering

FACULTY ADVISORS
Dr. Trina Moskalik
Dr. Rainer Lehmann

COMPANY NAME
Alto-Shaam Inc.

ALTO-SHAAM

Process Analysis and Optimization by Implementation of Production Leveling

Alto-Shaam wants to improve utilization of capital equipment in their finishing and welding department. The project focuses on three work areas that use automated welding robots equipped with two station positioners / dual welding cells.

The goal is to achieve a higher throughput by synchronizing the welding times of the robots with the time needed by the operator to prepare the next station for the welding process.

To achieve this goal, the production process is analyzed and time studies for all produced parts are made. For each work area, heijunka boards are developed, and based on this fixed schedule, production planning and material replenishment are adjusted. To further improve the overall process, the project scope also includes work cell transformation to optimize layout, material presentation and workflow.

STUDENT NAME
Seth Bernard
B.S. Operations and Systems Management

FACULTY ADVISOR
Dr. David Rollins

COMPANY NAME
Milwaukee Jr. Admirals

MILWAUKEE JR. ADMIRALS

Data-Driven Player Development

The Milwaukee Jr. Admirals are one of the nation's top youth hockey organizations. Focused on developing young hockey players, the Admirals have top tier coaching and staff to help get them to the next level. The Project that follows is aimed at setting up a more structured plan to achieve this goal. By using current player in-game statistics, physical player information, and medical articles related to physiological performance in adolescents, a training program will be developed that can be tailored specifically to each player in the organization. Plans will include off-ice training modules to be completed. Modules will shift week to week based on what each player's body needs. Modules will also have guidance on the various mental techniques, which players can use to improve their mindset and how they prepare. This structure will help players improve and enhance attributes that will increase performance on ice.

Humanities, Social Science and Communication Department

User Experience Senior Projects

STUDENTS NAMES
Reese Derksen
Nancy Ismail
Alana Perry
Nick Profenna

FACULTY ADVISOR
Dr. Tammy Rice-Bailey

Redesigning Diabetic Ketoacidosis (DKA) Treatment Guidelines

This project centered on improving the usability and visual clarity of the Diabetic Ketoacidosis (DKA) treatment guidelines currently used at Children's Hospital. The original guidelines, authored by an endocrinologist, were difficult to interpret quickly in clinical settings. The UX students redesigned these guidelines as several easy-to-read documents that can be stored as PDFs on an internal server and can also be printed and laminated for use at the point of care.

STUDENTS NAMES
William Heffernan
Cody Kaas
Alexis Ovokaitys
Achuth Nair

FACULTY ADVISOR
Dr. Tammy Rice-Bailey

Better Tracking and Follow Up with "Leave Not Seen" (LNS) Patients in the Emergency Department

This project addressed a patient flow and follow-up issue at Froedtert Hospital's Emergency Department. More specifically, patients who begin a medical workup (including vitals and lab tests) but left before being evaluated by a physician are recorded under the metric "Leave Not Seen" (LNS). Because care had already started, the hospital faced both logistical and liability challenges in how to track and follow up with these patients. This team designed a prototype solution for better tracking and follow-up systems for LNS cases.

Mathematics Department

Actuarial Science Senior Projects

TEAM MEMBERS
Stacey Cloute

FACULTY ADVISOR
Dr. Jinkai Xu

Medicare Advantage – Risk Adjustment Analysis

This project explains how the Medicare Advantage Mid-Year Risk Adjustment Accrual is estimated and incorporated into financial reporting. It reviews MA risk-adjustment fundamentals, including how CMS uses demographic data and HCCs to generate risk scores. It also shows how member-level risk scores are tracked over time to support accrual calculations, modeling, and margin setting.

TEAM MEMBERS
Emilio Ulloa Payro
Andrew Justus

FACULTY ADVISOR
Dr. Jinkai Xu

Modeling Inflation Dynamics in Mexico

This project examines the key determinants of inflation in Mexico using a multivariate econometric approach. It integrates domestic macroeconomic variables, such as GDP growth, interest rates, exchange rates, and labor indicators, with external U.S. economic factors to capture cross-country influence. Granger causality tests are used to identify predictive relationships between variables, guiding model selection. A generalized linear model (GLM) is then developed to estimate inflation dynamics, followed by diagnostic testing (e.g., multicollinearity and statistical significance) to ensure model validity. The model's predictive performance is evaluated through out-of-sample testing, allowing comparison between expected and realized inflation. The results provide insight into the role of domestic fundamentals and international linkages, offering a data-driven benchmark for understanding inflation behavior beyond official policy targets.

TEAM MEMBERS
Samantha Shaver
Alayna Fry
Rebecka Miranda

FACULTY ADVISOR
Dr. Jinkai Xu

SPONSOR
Allstate

Impact of Annual Rate Certifications (ARCs)

This project aims to determine how Annual Rate Certifications (ARCs) impact business. Metrics such as policy performance, sales, and actuarial measures such as Actual-to-Expected (A/E) and Loss Ratio are used to understand trends over time accompanied by several rate decreases for a given product in specific states. Furthermore, this project examines the performance of various benefit levels over time alongside rate changes. By observing experience for specific benefit levels, the impact of shutting off poorly performing benefit levels is evaluated as a potential solution for improving product performance in response to rate decreases. Finally, an analysis of publicly available competitor data collected through SERF is used to determine if the impacts of ARCs are being handled similarly across companies.

TEAM MEMBERS
Gavin Graham
James Zippay

FACULTY ADVISOR
Dr. Jinkai Xu

Outstanding Claims Reserving Methods

This project aims to explore different methods of calculating outstanding claims reserves from past events, a major part of the Society of Actuaries' sixth exam, Advanced Short-Term Actuarial Mathematics. Calculations begin with run-off triangles based on claim payments, and then making projections to future development years, using methods such as deterministic chain ladder, Bornhuetter-Ferguson, Buhlmann-Straub, Poisson and Overdispersed Poisson models. Each model will be explained with assumptions, theory, and Excel examples. Additional topics include test statistics for correlation and calendar year effects on claim development. Ultimately, the benefits and drawbacks of different reserving methods will be compared, and we'll look at next steps.

TEAM MEMBERS
Braeden Roth
Wilfried Tapsoba
Chidubem Uchegbu
Nathan Wilde

FACULTY ADVISOR
Dr. Milad Tatari

Ankle Foot Orthotic Simulator

Traditional Ankle-Foot Orthotic (AFO) design relies on repeated, time-consuming physical fittings that require the patient's continuous presence, leading to significant delays in treatment and potential discomfort. This project aims to develop a high-fidelity Ankle-Foot Simulator (AFS) capable of capturing precise biomechanical and anatomical data to enable the digital optimization and custom design of patient-specific orthotics without the need for repeated physical fittings. Our solution is a robotic single-leg system held in a sturdy frame that features adjustable limb segments capable of replicating complex human gait trajectories. The design integrates high-density encoders, MPU 6050 IMU sensors, and a controller to precisely track motion and simulate passive ankle dynamics. By utilizing inverse kinematics, the simulator accurately converts patient gait data into mechanical joint angles to replicate a unique walking cycle, allowing for rigorous testing of orthotic designs in a lab environment. By facilitating a "proper fit on the first trial," this simulator streamlines clinical workflows and reduces healthcare costs while advancing the development of personalized assistive technologies for patients with neuromuscular conditions.

TEAM MEMBERS
Zachary Brzezinski
Nathan Guevin
Zac Kotecki
Andrew Toman
Andrew Webb

FACULTY ADVISOR
Dr. Nathan Patterson

AGV Fleet

With MSOE's upcoming robotics lab, this team developed a scaled AGV (automatically guided vehicle) platform that will be used to teach students about robotics and warehouse environments. With a limited width and length of 10 inches, this platform is capable of lifting and relocating pallets weighing up to 250 lbs. Traveling at a speed of 1.5 m/s, this design has a runtime of 20 minutes and a removable battery for recharging. Bluetooth control of a custom PCB is the heart of the robot, while gear trains including worm and lead screws execute the movement. This design was used to make a fleet of five robots and is fully 3D-printed so the fleet can be expanded with ease.

Mechanical Engineering Department

Mechanical Engineering Projects

TEAM MEMBERS
Neil Kinnan
Maximiliano Munoz

FACULTY ADVISOR
Dr. Nathan Patterson

3D Printed Motorcycle

Many commercially available RC motorcycles lack both high-speed capability and reliable self-stabilization. The objective of this project is to design and print a high-performance, durable, and self-stabilizing RC motorcycle. The system will utilize an Arduino Wi-Fi microcontroller to provide throttle and steering control through a servo-actuated front fork and brushless DC motor. Aerodynamic optimization will be incorporated through a streamlined body design, supported by CFD analysis to evaluate drag reduction and downforce generation. A traditional fork suspension system with integrated springs and damping tubes will be implemented to improve handling and structural durability. The final design aims to achieve reliable high-speed performance while maintaining stability and structural integrity.

TEAM MEMBERS
Maximillian Koziarski
Jacob Tralongo

FACULTY ADVISOR
Dr. Sebastijanovic Nebojsa

Baja Front Suspension

Baja SAE vehicles experience extreme off-road loading conditions that place significant demands on suspension durability, geometry control, and overall vehicle handling. The goal of this project was to redesign the front suspension system to improve geometric performance, structural strength, and integration with the steering system while maintaining manufacturability and weight efficiency. The updated design incorporates revised upper and lower control arms, improved suspension geometry, and validated steering axis characteristics to improve camber behavior, steering stability, and suspension travel. Kinematic analysis and SolidWorks simulations were used to verify camber curves, motion ratios, and steering geometry, while finite element analysis evaluated the structural response of the suspension under a worst-case jump landing load. The resulting design provides a stronger and more predictable suspension system capable of withstanding the demanding conditions of Baja SAE competition while supporting future optimization and testing.

TEAM MEMBERS
Luke Anderson
Anthony Buechel
Timothy Schulz
Matthew Zupan

FACULTY ADVISOR
Dr. Mohammad Mahinfalah

ASME Student Design Competition

The 2025-2026 ASME Senior Design competition focuses on the global issue of the collection and sorting of garbage and recycling. The competition itself requires collegiate students to design, fabricate, and test a robot that collects, sorts, and disposes of garbage and recycling in a mock city landscape. The team developed a functioning robot with several subsystems each tasked to assist in accomplishing these goals: an articulated arm to grab and move waste bins, a vibrational sorting system with color sensing, a dump linkage system, and a drive base to tie them together. The team tested and iterated on the subsystems until functioning cohesively, which are controlled by a phone via Wi-Fi. The results may aid in design of automated, robotic waste collection units for less developed areas or places where manned collection is impractical.

TEAM MEMBERS
Nathaniel Bong
Cody Hettwer

FACULTY ADVISOR
Dr. Nebojsa Sebastijanovic

Baja SAE Front End redesign

The current Baja SAE vehicle front-end system utilizes separately mounted steering and drivetrain components, resulting in unnecessary weight and inefficient use of limited packaging space. The objective of this project is to redesign the front-end assembly to improve packaging efficiency and reduce overall weight while maintaining the structural integrity and performance required for off-road competition. The proposed design integrates the front differential housing with a steering rack mounting structure into a compact cylindrical assembly that minimizes excess material while remaining compatible with the existing chassis mounting points. The housing is designed to be CNC machined from 6061-T6 aluminum to achieve a balance of strength, weight reduction, and manufacturability, while a removable steering rack interface and serviceable differential cover allow for efficient maintenance and component replacement. This integrated approach demonstrates how consolidating mechanical subsystems can improve packaging efficiency and structural optimization in compact off-road vehicle applications.

TEAM MEMBERS
Ryan Anderson
Victor Bisog
Dani Krogh

FACULTY ADVISOR
Dr. Kevin Hart

Ultralight composite engine design for aircraft applications

Aircraft engines are typically fabricated using dense metals which are heavy and constitute a significant portion of aircraft mass, particularly in smaller single-passenger and unmanned aircraft. DeltaHawk, an aircraft engine manufacturer based in Southeast WI, has contracted our design group to develop a lightweight aircraft engine block, fabricated primarily from fiber-reinforced polymer composites. In this design showcase, we present the design of an aircraft engine block fabricated from a glass-fiber and phenolic resin composite material, manufactured in the U.S. using a compressing molding process. Our proposed design weighs 32.4 lbs., which reduces the mass by approximately 35% relative to an aluminum engine block. Reductions in mass provide greater fuel efficiency, reduced emissions, and improved flight performance.

TEAM MEMBERS
Connell Fryer
Joseph LaBeef
Daniel Marciniak
Nicholas Segvich
Leylani Vasquez

FACULTY ADVISOR
Dr. Mark Fleming

Energy Recapture | Engel Tool + Forge

At Engel Forge, steel billets enter induction heaters at 2,200°F and forged parts are left to cool in ambient air, resulting in a significant loss of recoverable thermal energy. This project aims to design a system that captures heat released from cooling forged parts and converts it into usable electrical energy. The proposed solution is a heat recovery enclosure that captures convective and radiative heat from hot parts while circulating water through copper tubing to absorb the thermal energy. Experimental testing uses heated parts to simulate forging conditions and measures water temperature changes to estimate the amount of energy that can be recovered. Implementing a system like this could improve energy efficiency at Engel Forge and reduce the facility's overall electrical consumption.

TEAM MEMBERS
Harrison Crasko
John Finnell
Dylan Lawler
Wyatt Leasure

FACULTY ADVISOR
Dr. Richard Dykowski

Enerpac Battery Torque Wrench Gearbox

The gearbox on Enerpac's new BTW series 3,000 lb.-ft. torque wrench is excessively long and heavy, resulting in increased user fatigue during operation. The project goal was to reduce the gearbox length and weight, and to move its center of gravity closer to the handle for easier use. The team used a decision matrix to evaluate several design options before selecting a split ring planetary compound gear stage. This design generates a high torque multiplication in a compact package. The entire gearbox will be 3D-printed in plastic to test fitment and speed reduction, and the final stage of the gearbox will be machined to conduct stress testing on the gear teeth.

TEAM MEMBERS
Tobias Landes
Alexander Lo
Luke Partipilo

FACULTY ADVISOR
Dr. Anand B. Vyas

Engineered Pumps Services

Engineered Pump Services does not have a prototype model of the types of pumps they commonly service. The team's goal was to make a scale model of a pump that follows the API 610 BB4 Standard as well as display common features of the pump. The team reverse engineered a KSB HGC 5/7 boiler feed pump by taking 3D scans of the parts then modeling them using SolidWorks software and making modifications as necessary. With the completed model of each component, they were 3D-printed using a Bambu Lab 3D printer then assembled. The final assembly allowed Engineered Pumps Services to show potential customers and students the type of pump they commonly service.

TEAM MEMBERS
Luke Navin
Brady Oleszak
Kaitlin Pedersen
Daniel Venegas

SENIOR DESIGN SCHOLARS*
Salman Ibrahim
Nicolas VanDierendonck

FACULTY ADVISOR
Dr. Kevin Hart

Helwig Carbon Test Stand

Helwig Carbon Products Inc. is a manufacturer of high-quality carbon brushers and brush holders. Helwig has contracted our senior design group to create a test stand to study the mechanical and electrical fatigue wear of large carbon brushes used in high-current, low-voltage rail-powered applications. In this design showcase, our team will present our solution to this challenge and provide videos of the test-stand in operation at the Helwig site. CAD models, electrical wiring diagrams, control schemes, and component selection will be showcased. The test stand was designed to record several diagnostics while running, including contact load between the brushes and the rails, current flow from the brushes to the rails, and brush temperature. Preliminary data from test stand operation will also be presented. The test stand will ultimately allow Helwig to prescribe contact pressure and fatigue life of their brushes while in use under highly demanding electromechanical conditions.

TEAM MEMBERS
Daniel Cantu
Mike Rose
Guadalupe Sandoval
William Schewe

FACULTY ADVISOR
Dr. Luis A. Rodriguez

Project: Fluid Power Vehicle Challenge

Every year, the NFPA (National Fluid Power Association) hosts a competition focused on enhancing the fluid power industry in the collegiate space through the development of a human and fluid powered vehicle. This team participated in the 2026 competition by designing and fabricating a novel vehicle. The objectives of the design were to be innovative, efficient, well performing in race environments and safe, all while incorporating pneumatics and industry practices into the design. This design demonstrates acquired knowledge of fluid power and its supporting components.

**Senior design scholars are high school students who are admitted to MSOE and participate on senior design teams. The Senior Design Scholars Program provides participants with mentoring experiences and opportunities to enhance leadership, team building, cross-cultural communication and analytical skills in science, technology, engineering and math (STEM). Scholar participation is by application. American Family Insurance sponsors the Senior Design Scholars Program.*

TEAM MEMBER
Jordan Disch

FACULTY ADVISOR
Dr. Kevin Hart

MSOE/MIAD IHA Housewares Design

Air quality is often much worse in residential spaces than outdoor and commercial spaces, and a compact solution to whole home air purification does not exist on the current market. An MSOE mechanical engineering student and a MIAD product design student collaborated to design a compact, whole home air purification system. To aid in the design process, they conducted research relating to the problem, solutions, current market, and got feedback from potential users. Along with research, some calculations were conducted to source the necessary components. The students utilized their respective design and engineering skills to iteratively design a stylish product that would remove a wide variety of contaminants from the air quickly. A testing chamber was constructed and used to verify the selected components would be effective. The resulting product utilizes the pairing of art and engineering to produce a product which solves an important everyday problem.

TEAM MEMBERS
Aidan Lindner

FACULTY ADVISOR
Dr. Kevin Hart

Mobile Automatic Winding Hose Reel

With most winding hose reels now, there are lots of problems regarding the difficulty of winding manually, the tangling and kinking in storage of the hose in the reel, and the mobility of the entire product being limited. The design solution developed is an automatic hose reel that can hold up to 50 ft. of 5/8" diameter hose, and it is wound by an automatic mechanism that can lock and is attached to a cart frame made from aluminum tubing. The cart frame can also be moved easily because it is on wheelbarrow wheels to be able to move over uneven terrain that is usually in backyards, and two hose reels make it possible to move back and forth. This design makes using a hose easier and solves the problems of kinking in storage.

TEAM MEMBERS
Mitchell Brust
Ruth Dobberpuhl
Clayton Fliss
Ethan Hasselwood
Ian Rassmussen

SENIOR DESIGN SCHOLARS*
Salman Ibrahim
Nicolas VanDierendonck

FACULTY ADVISOR
Dr. Mathew Schaefer

Lunar Terrain Testing Chamber

As the ambitions of the NASA Artemis missions grow, accessible facilities that realistically simulate lunar conditions are needed to support rover development. This project designs and builds a lunar terrain testing chamber to support the NASA Lunabotics Competition team through controlled, repeatable testing. The chamber uses lunar regolith simulant and integrates negative pressure containment and filtration to ensure safe laboratory operation. It enables evaluation of rover mobility, excavation performance, ingress protection, and autonomous systems under realistic conditions. The facility will improve testing capability, reduce risk before competition, and serve as a long-term resource for lunar research, education, and community engagement.

TEAM MEMBERS
Joseph Loeffler-Bell
Clark Rue
Charlie Schuenke
Shavkat Yaparov

FACULTY ADVISOR
Dr. Ruiyang Wang

1-D MagLev Test Stand for Controls Lab

The purpose of this project is to be able to control the distance between a ferromagnetic washer and an electromagnet. In order to achieve this, a permanent magnet was combined with a coil of wire. The permanent magnet pulls on the washer, while the current through the wire modifies the total magnetic force. This is an inherently unstable system, so high resolution sensors are used to track both the distance of the washer and the current through the wire. Control theory is then applied using the Simulink software package in conjunction with other electronic components such as the primary microcontroller and current inverter.

**Senior design scholars are high school students who are admitted to MSOE and participate on senior design teams. The Senior Design Scholars Program provides participants with mentoring experiences and opportunities to enhance leadership, team building, cross-cultural communication and analytical skills in science, technology, engineering and math (STEM). Scholar participation is by application. American Family Insurance sponsors the Senior Design Scholars Program.*

TEAM MEMBERS
Ian Frey
Alexander Phillis
Zach Schuster

FACULTY ADVISOR
Dr. Amirreza Lotfolahpour

MSOE STEM Center Demo

The Stem Center at MSOE wanted an educational demonstration for middle school students to teach them about fluid power. The demonstration should be engaging and help the students to learn more about fluid power. This team designed, built, and tested, a 3D-printed fire engine ladder kit for the students to build in class. The kit uses water powered hydraulic pistons to actuate, and sprays water. It is designed to highlight the concepts of Pascal's Law and Bernoulli's Principle. Their final product demonstrates an understanding of fluid power and mechanics, and a desire to get more young students into STEM.

TEAM MEMBERS
Abby Balkema
Enzo Boza
Austin Killen
Katie Taticek

FACULTY ADVISOR
Dr. Robert Rizza

Ankle Foot Orthotic Controller

A neuromuscular condition called foot drop disrupts how a person walks and increases risk of them falling from inadequate ankle flexion. This team improved and redesigned a locking mechanism on a hinged ankle foot orthotic (HAFO) to help ankle control throughout walking. The improved HAFO controller aims to reduce fall risk, help stability, and increase mobility. The mechanism locks and unlocks, controlling the HAFO and ankle positioning during the gait cycle from when the foot contacts the ground to the next time the foot contacts the ground again. Two different braking concepts—a non-differential and a differential band brake—were evaluated to determine if they can control the HAFO by developing enough friction for ankle movement. Experiments were conducted to analyze different band configurations, materials, and forces to determine a coefficient of friction that guided material selection, circuit design, and solenoid sizing.

TEAM MEMBERS
Ryan Cox
Rachael Klamecki
Maclane Wightman

FACULTY ADVISORS
Dr. Xue-Cheng Liu
Dr. Robert Rizza

Design of a Cranial Helmet for Treatment of Plagiocephaly

Plagiocephaly, also known as flat head syndrome, is a common deformity affecting up to 50% of infants in the first few months of life. The primary treatment for plagiocephaly is a cranial helmet device, which, due to the antiquated design and manufacturing, can benefit from advancements in production rate through additive manufacturing and weight optimization using lattice structures. The team's design solution consists of an SLS-printed polypropylene cranial helmet fitted with windows to hold lattice inserts, enhancing breathability, reducing weight, and maintaining structural integrity to correct the deformation of the infant's head. Due to the nature of the helmet, patients must wear the device for up to 23 hours a day, and with these improvements, the group aims to create a more comfortable experience than traditional helmets, ultimately improving effectiveness of the treatment of plagiocephaly.

TEAM MEMBERS
Robert Pach
Dominic Puglise
Austin Schwab
Colin Todd

FACULTY ADVISOR
Dr. Brian Slaboch

Mechanism Design Competition Team

Typical industrial robots have a fixed topology which often leads to a limited usable workspace. The Mechanism Design Competition Team has designed and manufactured a new SCARA-type robot that can seamlessly switch its topology, allowing for unique motion paths and an expanded reachable workspace. This was achieved by designing a new type of variable joint, implementing a robust control system, and integrating a vision system to achieve pick-and-place motions with a pneumatic actuator. Objects can be rapidly sorted using the new robot configuration. The project demonstrates a combination of software, electrical, and mechanical expertise. The broader impact of the work is a new type of robot that can be used for fixed-automation tasks across industries such as the automotive, food processing, and pharmaceutical industries.

TEAM MEMBERS
Andre De Wet-Daniels
Tobias Engle
Ryan LeMay
Maya Liebel
Todor Neykov

FACULTY ADVISORS
Dr. Mohammad Mahinfalah
Austin Kour

Milwaukee Tool Water-Cooled PCBA

The Milwaukee M18 Fuel 9" Cut-Off Saw experiences significant overheating during high- current operation, placing thermal stress on critical electronic components. This project investigates whether the tool's existing water supply can be adapted to cool internal electronics and reduce thermal loading. The team conducted thermal imaging and teardown analysis to identify key heat sources, evaluated feasible water-cooling strategies, and selected a cold plate approach for experimental validation. A custom test fixture was designed, manufactured, and iteratively refined to replicate realistic operating conditions. An experimental procedure was developed and executed to establish baseline thermal performance and cooling response using integrated thermocouples and custom electrical load monitoring connected to a digital data acquisition system. Preliminary results demonstrate that water-assisted cooling is both feasible and experimentally verifiable within the tool's constraints. This work establishes a validated experimental foundation for implementing a practical internal water-cooling solution to improve tool durability and performance.

TEAM MEMBERS
Jacob Betz
Myles Pratt
Zane Rothe
Lucas Weigand

FACULTY ADVISOR
Dr. Daniel Williams

Nutris RX – Automatic Supplement Dispensing Unit

Nutris RX, a local producer of specialty pet food supplements, required a sanitary and repeatable system for dispensing powdered products into jars with consistent accuracy exceeding 95%. Their previous method lacked accuracy, consistency, and cleanability, limiting production efficiency. This project developed a food-grade powder dispensing system using fully dishwasher-safe product contacting components. The team evaluated multiple dispensing technologies, reviewed industry food-safety standards, and tested iterative prototypes. Experimental results identified a pinch valve mechanism as the most reliable approach for controlled powder flow. Based on these findings, an automated system was designed and fabricated, integrating an aluminum extrusion frame, stainless steel hopper, and a specialized food-grade silicone valve sleeve. A custom printed circuit board with microcontroller interface uses a load cell to provide closed-loop mass dispensing control. The final system improves accuracy, repeatability, and sanitation compliance for Nutris RX's production process.

TEAM MEMBERS
Franchesco Carnevali
Parker Frey
Lorenzo Giannini
Ansar Keulimzhayev

FACULTY ADVISOR
Dr. Daniel Williams

Portable Eavestrough Cleaner

Clogged residential gutters require hazardous manual cleaning, exposing homeowners to safety risks and making routine maintenance inefficient and time-consuming. The goal of this project was to design and develop an automated robotic system capable of safely navigating and cleaning residential gutters. Portable Eavestrough Cleaner is a compact robot engineered to operate within confined gutter environments while effectively removing debris. A full-scale gutter prototype was constructed to evaluate mobility, cleaning performance, and system reliability under realistic conditions. Key components, including the chassis, electrical enclosure, and drive shafts, were custom-designed and prototyped using 3D printing to enable iterative improvements. This project demonstrates the potential of accessible robotic automation to improve safety and efficiency in a home maintenance application.

TEAM MEMBERS
Tymoteusz Czerwiec
Connor Furlong
Elizabeth Kuhn
Noah Reynolds

FACULTY ADVISOR
Dr. Prabhakar Venkateswaran

Multi-phase Fuel Injector for a Turbojet Engine

This project entails the design and implementation of a multi-phase fuel injector for use in a small-scale turbojet engine intended for educational use at Milwaukee School of Engineering. The injector is designed to operate with both gaseous and liquid fuels, enabling sustained operation with both propane and liquid aviation fuels. Two fuel injectors were designed and manufactured in-house, providing multiple options for fuel flexible operation of the engine. The injector system emphasizes modularity, allowing rapid changes between injector configurations. By designing multiple injectors that can operate with both gas- and liquid-phase fuels, students will be able to experimentally investigate the effects of injector geometry, fuel phase, and fuel type on engine performance. The resulting experimental platform will be a unique hands-on laboratory experience where students can learn about propulsion, fluid mechanics, and combustion.

TEAM MEMBERS
Owen Erickson
Joce Katte
Charly Pyper
Erik Wirtz

FACULTY ADVISOR
Dr. Brian Slaboch

Assistive Board Game System

Board games are a valuable way for people to socialize and connect. However, a common issue is that they often require physical interaction with certain components, which can exclude individuals with reduced physical mobility. The goal of this project is to develop an accessible, Monopoly-style board game that allows users to participate without needing to physically manipulate game pieces. This team developed a graphical user interface along with a physical system that moves tokens and rolls dice using an automated game board. Players interact with the game through the click-based GUI, designed to work with common accessibility tools, including off-the-shelf eye-tracking software. Each player can access the interface from their own personal device, while only the banker is required to install software to control the game's hardware. By reducing the need for physical interaction, this design aims to make board games more accessible and inclusive for individuals with limited mobility.

TEAM MEMBERS
Jacob Koziol
Bjarne Poehlsen
Charles May
Logan Schoo

FACULTY ADVISOR
Dr. Michael Sevier

ToAD Barrier – Team 1: New Fence Design

The Tour of America's Dairyland is a cycling race series in Wisconsin, held since 2009. The fencing used throughout the racecourse poses safety risks, such as riders entangling their limbs in openings or being cut by sharp edges during crashes if the fence is tipped over. The purpose of this project is to increase and improve rider safety, particularly with respect to reducing risk of major injury in crash situations. The design solution includes a new fencing material and a blow-molding manufacturing process for plastic to create complex geometry fencing with safe edges. The fence face geometry is designed to allow maximum airflow while keeping the openings as small as possible to counteract entanglements. Additionally, a new foot and connection design with clip-in and rotating capabilities enables an efficient setup of fence lines. The resulting fence design improves rider and spectator safety while enabling faster and more efficient racecourse setup.

TEAM MEMBERS
Ryan Alyassir
Damian Kukuc
Patrick Lee
Micah Pollnow

FACULTY ADVISOR
Dr. Nathan Patterson

Remote Controlled Ship-to-Shore Crane Fleet

As robotics and automation continue to expand in industry, Milwaukee School of Engineering is developing hands-on platforms to support student learning in these areas. This team aims to design and build three remote-controlled, 1/50-scale ship-to-shore cranes that replicate key functionalities of full-scale cranes, for use in future robotic and automation projects. The crane frameworks are constructed from aluminum extrusions, while stepper motors, DC motors, and servo motors were integrated into mechanical systems designed by the team. Using 3D modeling software and additive manufacturing, individual subsystems were tested and refined before being assembled into a complete system. Iterative testing in a simulated port environment is used to refine final crane designs, controller outputs, and validate performance. These cranes will provide a flexible platform to support robotics and automation education at MSOE.

TEAM MEMBERS
Mino Elze
Joseph Moore
Grant Race

FACULTY ADVISOR
Dr. Kevin Hart

IHA Competition

Conventional cutting boards hold harmful bacteria and are difficult to sanitize effectively, presenting a significant food safety risk in household kitchens. The goal of this project was to design a high-end, self-contained device that hygienically sanitizes and dries a standard cutting board, regardless of its material. This team's proposed solution, Lumora, is a sleek countertop appliance that uses a combination of UV-C light, heat, and convection to automatically sanitize and dry a cutting board in under 45 minutes. The design features a universal user interface with simple status indicators and a form that seamlessly integrates into a modern kitchen. By providing an effective sanitization solution, Lumora elevates kitchen hygiene, offering consumers a convenient way to mitigate a common health concern in the home.

TEAM MEMBERS
Calaway Alderson
Chad Clogston
Erin Heuver
Logan Knott
James Watson
Marcus Winkel

FACULTY ADVISOR
Dr. Mark Fleming

AIAA Design Build Fly Competition

The goal of the 2025-2026 AIAA Design Build Fly competition is to design a banner towing remote-controlled bush plane capable of carrying cargo and passengers while performing three missions. The first mission is a three-lap test flight. The second mission involves carrying passengers and cargo for as many laps as possible in a five-minute flight window. The third mission requires deploying a banner midair, completing as many laps as possible, and releasing the banner before landing. The senior design team worked in focused subsections with Dr. Mark Fleming to design and build this aircraft. The team used CAD, aerodynamic calculations, and finite element analysis to guide the design process and create a functional remote-controlled aircraft. The final plane was 66" long, 59" wide, and featured a single motor. The plane was capable of carrying 16 passengers, one piece of cargo, and towing a 10" x 2" banner.

TEAM MEMBERS
Cruz Alonso Carmen Soto
Reese Christopher
Ahmed Habeebullah
Bradley Rosencrans
Gideon Woehl
Chase Wondra

FACULTY ADVISOR
Dr. Mathew Schaefer

Formula Hybrid Front Upright Assembly and Braking System

The current MSOE Formula Hybrid front upright assembly is heavier than necessary, limiting overall vehicle performance. The goal of this project is to redesign the front upright assembly and braking system to reduce total assembly weight by 25% while maintaining a minimum factor of safety of 2.76 under the worst load case. The team is developing an integrated assembly that includes the spindle, hub, bearings, brake rotor, caliper, and upright structure. We are changing suspension geometry to reduce bump steer. Topology optimization is used for upright geometry refinement. The designs are developed through free-body diagrams, CAD modeling, and FEA. Subsystem testing is used to validate brake system performance and steering kinematics. The final assembly will be installed and tested once production parts are fabricated, and a repeatable design framework will be developed to support future MSOE Formula Hybrid teams.

TEAM MEMBERS
Mason Accidentale
Caleb Koester
Elijah Villa
Luke Wilson

FACULTY ADVISOR
Dr. Brian Slaboch

Mr. Monopoly's Auto-opoly

Board games such as Monopoly can be challenging to play for individuals with limited mobility. This team developed an automated version of Monopoly which is operable using only mouse clicks, moving game pieces and rolling dice in the physical space while managing properties and cards through a graphical interface. This team developed a CoreXY system with a custom head design to move game pieces with a magnet below the board. A dice-roller mechanism was also created, utilizing a vision system to read the dice. To control these, a Monopoly game was implemented using WebSockets, allowing players to connect to the game from their own devices via a QR code or link. The final deliverable demonstrates the technical feasibility of combining multiple high-level systems to create a realistic Monopoly experience without ever needing to touch the board.

TEAM MEMBERS
Luke Langjahr
Michael Stotler
Seth Thomas

FACULTY ADVISOR
Dr. Michael Sevier

Tour of America's Dairyland Bike Barrier Project

Tour of America's Dairyland (ToAD) currently uses steel bike racing barriers with sharp 90-degree edges and open gaps that pose serious injury risks to riders during crashes. The goal of this project is to develop a safer, aerodynamic, reusable, easy set-up and take-down barrier solution that eliminates entanglement hazards and reduces impact severity. Our design features a high-strength netting system tensioned in front of the existing barrier to absorb and distribute impact forces during a crash. Permanent hardware is mounted to the barrier feet, allowing the net to be quickly secured on race days using rear ratchet straps and front eye nuts with carabiners for adjustable tension. The components are low-cost, sold in bulk, and easily replaceable, making the system affordable to manufacture, simple to transport, and efficient to deploy across multiple barriers. By reducing injury risk, the design enhances race safety and supports the long-term sustainability of competitive cycling events.

TEAM MEMBERS
Colin Duren
Johnathan Lapsa
Sean Wilwert

FACULTY ADVISOR
Dr. Anand B. Vyas

Wave Energy Converter

The increasing demand for clean, renewable energy underscores the importance of exploring alternatives beyond wind and solar, with wave energy representing a dense yet largely untapped resource. This project responds to that opportunity by developing a safe, portable demonstration kit that converts wave motion into measurable electrical power without relying on turbines, providing a reliable and educational platform for illustrating the principles of wave-to-electric energy conversion. With a constrained system volume of 0.2 cubic meters, the design uses a cable-driven transmission linking the buoy, submerged pulley, and elevated drum to convert the buoy's linear wave-induced motion into rotational input. The drum then engages a unidirectional ratchet integrated into a gear train, where a flywheel smooths and amplifies the motion before delivering it to the generator. The wave energy converter will be designed for consistent performance, easy assembly, and long-term durability, providing a practical and repeatable instructional tool that effectively demonstrates the core principles of wave-energy conversion.

Industrial Engineering Projects

COMPANY PARTNER:
Doosan Bobcat, Inc.

TEAM MEMBERS
Isaac Bensen
Camden Ellingson
Zachary Stoffel

FACULTY ADVISOR
Patrick Gathof

Improving Ergonomics in Tire Installation

This project focuses on improving ergonomics and material handling in the rear tire installation process at Doosan Bobcat North America's Johnson Creek facility. Operators currently lift 23–33 lb. tires from low pallets, which requires significant reaching and results in a Modified NIOSH Lifting Index of up to 3.028, which is above the recommended safe limit. Through time studies, ergonomic analysis, and workstation observations, our team identified horizontal reach as the primary driver of risk. To address this, we developed practical, low-cost improvements, including reducing the number of line-side pallets, creating standardized work instructions, and adjusting the layout to minimize unnecessary movement. These changes are expected to bring lifting conditions within safe limits without affecting throughput. Overall, the project improves operator safety, creates more consistent work practices, and supports a more efficient and user-friendly workstation design.

COMPANY PARTNER
Filtration Systems Incorporated (FSI)

TEAM MEMBERS
Emma Asselin
Michael Rohrman

FACULTY ADVISOR
Kaylie Butt

Cycle Time Reduction Strategies for Rolling and Welding Operations Using Discrete Event Simulation

With the introduction of a new product line, Filtration Systems Inc. (FSI) anticipates demand for the rolling and welding cell to exceed maximum capacity. This project aimed to reduce cell cycle time through the development of a data-driven model and evaluation of improvement strategies. Time studies were conducted to measure rolling, welding, transportation, and cleaning activities across a range of can sizes and product types. These data were used to categorize products by size and assign key system attributes, including arrival patterns, processing times, and transportation allowances. The resulting dataset supports the development of a discrete-event simulation model that replicates current system performance and enables the evaluation of alternative staffing configurations, equipment additions, and material release policies. This model will be used to identify strategies that improve cycle time, increase throughput, and support informed operational decision-making.

COMPANY PARTNER
Filtration Systems Incorporated (FSI)

TEAM MEMBERS
Jakob Bar-Din
Miguel Lopez

FACULTY ADVISOR
Patrick Gathof

Ergonomic and Process Improvements for Carbon Canister Production

This project addresses inefficiencies and ergonomic risk in the carbon canister manufacturing process at Filtration Systems Inc. (FSI). Time studies, non-value-added time (NVAT) analysis, process mapping, and 7+1 wastes analysis identified 83 seconds of NVAT in the current process, primarily caused by excess transportation and overprocessing. The project aims to reduce NVAT by at least 10% through workflow modifications that streamline material flow and eliminate unnecessary movement. In addition, the sock stretching operation was identified as a significant ergonomic concern. A Rapid Upper Limb Assessment (RULA) yielded a score of 4, indicating changes are required. To address this, a specialized tool will be developed to reduce manual force and repetitive motion, targeting a RULA score of 2. Together, these improvements are expected to enhance process efficiency while improving operator safety and overall working conditions.

COMPANY PARTNER
Filtration Systems Incorporated (FSI)

TEAM MEMBERS
Jacqueline Keane
Alfredo Lopez

FACULTY ADVISOR
Dr. Douglas Grabenstetter

FSI Facility Redesign

Filtration Systems Incorporated (FSI) manufactures a diverse range of filtration products within a high mix, low-volume, make-to-order production environment. As the company expands its product portfolio to meet customer demand, it has become increasingly constrained by available facility space. Over time, overproduction has contributed to inefficient use of valuable floor space, limiting operational flexibility. These space constraints restrict FSI's ability to introduce new product lines, reducing production capacity and creating missed revenue opportunities. To address this challenge, a Six Sigma phase-based approach was applied to evaluate current space utilization and identify improvement opportunities. The project delivers data-driven recommendations to optimize facility layout and space usage, enabling the integration of new production equipment. These improvements position FSI to expand its product offerings, pursue new customers, and increase overall operational efficiency and revenue.

COMPANY PARTNER
Hydac International GmbH

TEAM MEMBERS
Samantha Barth
Diego Snell-Martinez

FACULTY ADVISOR
Dr. Nathan Patterson

HYDAC O-Ring Assembly Through Semi-Automation

The HYDAC O-Ring Assembly Through Semi-Automation project addresses inefficiencies in the manual handling and installation of O-rings during check valve assembly. Currently, operators pick and place small O-rings by hand, leading to inconsistent placement, longer cycle times, and increased operator fatigue. The goal of this project is to design and prototype a semi-automated O-ring dispensing system that reliably delivers a single O-ring to a consistent installation location. The system incorporates bulk storage, a single O-ring, a singulation mechanism to ensure one-at-a time dispensing, and a controlled output interface compatible with existing assembly equipment. The proposed solution is expected to improve part presentation and reduce manual handling, resulting in more consistent assembly, decreased cycle time variability, and increased overall manufacturing efficiency.

COMPANY PARTNER
Marlo Incorporated

TEAM MEMBERS
Christian Briggs
Charlene Yumang

FACULTY ADVISOR
Dr. Chaucey Chandler

Marlo Process Improvements

Marlo Inc.'s residential production area faces a recurring capacity shortfall, with average monthly demand requiring 396 labor hours compared to only 212 hours of planned capacity. This 184-hour gap has contributed to an on-time delivery rate of 79%, falling short of the company's 95% target and having an impact on operational performance and customer satisfaction. To address this issue, the objective was to increase planned capacity from 212 to 341 labor hours through the addition of an assembly line and improved labor allocation decisions. The proposed improvements are expected to enhance on-time delivery, increase throughput efficiency, and reduce cycle times. Additional benefits include improved employee morale, greater operational flexibility, stronger process control, and more effective training through the implementation of standardized procedures. Together, these changes position the operation to better meet customer demand and improve overall performance.

School of Nursing

Fall Nursing Senior Design Projects

TEAM MEMBERS
Jordan Allen
Chau Doan
Zayne Jack

FACULTY ADVISOR
Dr. Cheryl Petersen

Catheter-Associated Urinary Tract Infection: A Chronic Issue in Inpatient Care

This paper proposes an evidence-based (EBP), nurse-driven program to reduce catheter-associated urinary tract infections (CAUTI) on a 31-bed medical-surgical unit at a community hospital. Utilizing Spradley's Change Theory, this project aims to standardize catheter care, strengthen documentation, and improve client outcomes while sustaining long-term, cost-effective organizational change. CAUTI remains prevalent in the inpatient setting due to gaps in tracking, charting inconsistencies, and the lack of standardized care, prompting this project after review of the literature. The CAUTI reduction program includes nurse education, standardized catheter care, and documentation training. There will be eight nurses and three clinical educators, who will all receive the educational training for eight weeks. Dependent variables are CAUTI incidence, catheter utilization rates, and documentation compliance as well as staff knowledge. Interventions consist of simulations, online modules, competency checklists, electronic health record (EHR) templates, and visual boards. Data will be collected via EHR and analyzed by comparing pre- and post-intervention CAUTI incidence rates, catheter utilization rates, and documentation compliance. The project is expected to reduce CAUTI incidences by 50%, improve documentation, and decrease catheter utilization through nurse-driven protocols. Staff competency is predicted to increase, while enhancing client safety. The proposed program underscores the critical role of nurses in reducing CAUTI. The initiative will contribute to existing knowledge by providing a structured approach to overcoming barriers to CAUTI prevention, such as inconsistent documentation and variability in urinary catheter education. Overall, the goal is to reduce the CAUTI incidence in inpatient settings and strengthen staff competency in CAUTI prevention.

TEAM MEMBERS
Brian Katzenberger
Kevin Lee
Luis Amezcua

FACULTY ADVISOR
Dr. Jane Paige

Ambient Monitoring Technology in Long-Term Care

Resident falls and delayed recognition of clinical decline remain significant safety concerns, especially within long-term care (LTC) facilities. Falls are often the leading cause of hospitalizations, increasing hospital costs, and changes in nursing workflows. In traditional nursing practices for patient monitoring, which include manual checks and physical observation, caregivers are limited to the number of staff employed and face time constraints. This project explores how ambient or passive patient monitoring technology may support improved resident outcomes and influence workload of staff. A literature review and workflow analysis were conducted to understand the potential benefits and barriers that currently exist when implementing these types of technologies. Factors that come into play when discussing fully implementing ambient sensor technology include electronic health record (EHR) integration, staff training, pilot testing, and nursing specifics for what is gained or lost with patient care. The evaluation plan for this project includes a focus on outcomes related to responding to resident condition changes, hospitalization rate, caregiver workload, and accuracy of collected data. The project illustrates potential applications of new technology for supporting resident safety and staff workflows.

TEAM MEMBERS
Madeline Anders
Katie Larson
Dylan Mabbutt

FACULTY ADVISOR
Dr. Melinda Salus-Rodriguez

Reducing Hospitalizations for Heart Failure Through Remote Monitoring Methods

Rates of heart failure (HF) in the United States are incredibly high, causing a massive burden on patients as well as healthcare systems. Due to the debilitating effects of this disease, HF patients often have high hospitalization and mortality rates. Typically, HF patients are placed on a standard set of interventions, including daily monitoring of blood pressure and weight, diet and exercise modifications, fluid and sodium restrictions, and medication management, however, these patients are often re-hospitalized soon after discharge. Remote monitoring techniques allow providers to observe patients outside the hospital, providing information about the effectiveness of treatment and disease progression. There are many available monitoring devices for HF, invasive and noninvasive, but one that appears promising is the ZOLL Heart Failure Management System, an external device applied to the left side of the chest which takes a variety of measurements including thoracic fluid volume, heart rate and rhythm, and respiratory rate. Based on the limited research on this device, this study proposes a randomized control experiment to evaluate its effectiveness. The experimental group will be tasked with wearing these devices for three months alongside receiving standard care for HF. Effectiveness will be determined by comparing mortality and re-hospitalization rates during the study between the control and experimental groups as well as qualitative statements about patient experience using the device. If found to be effective, the use of this technology could help to reduce the burden of HF and lead to earlier detection of exacerbations.

TEAM MEMBERS
Catherine Cabrera
Camille Pontarelli
Marinelle Manuntag

FACULTY ADVISOR
Dr. Cheryl Petersen

Professional Practice Project: Improving Inpatient Care of Incarcerated People

The United States incarcerates its people at the highest rate in the world, and many of these individuals experience inferior inpatient healthcare: less involved providers, fewer interventions, continuous shackling, minimal control of their surroundings, poor transitions between settings, and compromised privacy and autonomy. It has been suggested that unclear guidelines and inadequate training may be partially responsible for these disparities; therefore, this project is focused on improving the care of incarcerated individuals through targeted education for healthcare professionals. This topic was selected because this issue affects many people in our community, and we have witnessed firsthand the compromised care received by this population. We utilized the ACE Star Model of Knowledge Transformation to guide the design of an educational pilot program for 12-16 medical-surgical nurses in a Milwaukee hospital. Nurse participants will be given six weeks to complete three one-hour online modules covering legal and ethical issues faced by incarcerated people in the hospital setting, cultural humility, and trauma-informed care. They will then attend an in-person panel event featuring community experts with lived experience of incarceration, followed by facilitated small-group discussions. Evaluation will include pre- and post-intervention surveys that compare perceived competence in caring for incarcerated individuals, with follow-up at six months to determine sustained impact. Ultimately, this pilot program aims to explore how education can be leveraged to promote safe, ethical, and client-centered care that protects the rights and supports the well-being of incarcerated people.

TEAM MEMBERS
Aidan Felizmena
Darcie Nestler

FACULTY ADVISOR
Dr. Jessica Yates

Improving Nurse-Provider Communication in an Emergency Department using SBAR and the ADKAR model

This evidence-based professional practice project addresses observed inconsistent communication between nurses and providers in a level I trauma center emergency department (ED). These inconsistencies in communication impact exchange of patient information which contribute not only to reduced efficiency in interdisciplinary communication, but also to treatment delays and longer hospital stays for patients. The project focuses on the implementation of situation, background, assessment, and recommendation (SBAR) specific communication to improve the clarity in communication, and in turn, quicker turnover in an ED setting. Using the awareness, desire, knowledge, ability, and reinforcement (ADKAR) change model, this intervention aims to increase awareness of communication barriers, support staff engagement, and develop the knowledge and ability needed to apply SBAR more often during nurse and provider interactions. Implementation includes focused SBAR education sessions, visual reminders throughout the unit, and inclusion of SBAR prompts in documentation. The evaluation plan measures the changes in SBAR compliance, staff satisfaction, and length of stay to determine how structured communication impacts collaboration and workflow. Overall, this project highlights how maintaining structure in communication supported by a change model can promote safe and efficient care, as well as improve collaboration in the ED.

TEAM MEMBERS
Alisyn Haney
Lauren Hansen
Dru Henning

FACULTY ADVISOR
Dr. Jennifer Klug

An Evidence-Based Nurse-Led Education Intervention to Reduce 30-Day Readmissions in Diabetic Lower-Limb Amputees

Diabetic clients who undergo lower-limb amputation experience higher 30-day readmission rates. The aim of this evidence-based practice project is to reduce preventable rehospitalizations. These higher readmission rates are impacted by inadequate discharge education and poor self-management comprehension. To address the rate of readmissions, a 12-week enhanced discharge education program will be introduced on a post-surgical unit using the National Standards for Diabetes Self-Management (DSMES) framework. The 12-week pilot includes required 15-minute staff meetings that introduce the purpose of the project, reviews the evidence which supports a need for change, and introduces the required one-hour nurse education session. From weeks three through ten, all eligible clients will receive individualized teaching that starts at admission and continues through discharge. A 72-hour post-discharge phone call will be used to reinforce information and address any client questions. During the final week, the unit's 30-day readmission rate from the pilot period will be compared with the previous three months of baseline data to determine whether the intervention reduced readmission rates. Evaluation of this project will be done by monitoring nurse training completion, documentation compliance in the Electronic Health Record (EHR), completion of follow-up phone calls, and readmission rates. Findings will be analyzed and shared with the hospital staff to determine the effectiveness of the intervention. This project is expected to enhance client understanding, reduce remissions, and strengthen continuity of care through nurse-led education.

TEAM MEMBERS
Abigail Hart
Gabriella Nicoletopoulos
Lucyle Hawkins

FACULTY ADVISOR
Dr. Jane Paige

Promoting Fall Awareness and Prevention Among Community-Dwelling Older Adults

Falls are one of the most common causes of injury, hospitalization, and loss of independence among older adults (Montero-Odasso et al., 2022). Approximately one in three adults age 65 or older fall each year (Sturnieks et al., 2025). Existing fall-risk screening tools are designed for use by healthcare providers and are not intended for independent use by community-dwelling older adults. The aim of this project was to create a simple fall-risk self-assessment checklist that could be used at home to increase awareness of individual fall risk and to spark a conversation about fall prevention between older adults and their healthcare providers. The Stetler Model of evidence-based practice was used as a guide for this project. A one-page fall-risk self-assessment checklist was developed using validated items identified in the literature and refined with stakeholder feedback to improve readability and accessibility. The evaluation plan includes a six month follow up survey to assess checklist completion, usefulness, and whether the checklist supported a discussion with a healthcare provider about fall prevention. This nurse-led professional practice project offers a low-cost and accessible tool that may support safety, independence, and fall prevention in community-dwelling older adults.

TEAM MEMBERS
Nishath Hussaini
Danielle Singer
Raya Twardokus

FACULTY ADVISOR
Dr. Jessica Yates

Improving PIVC Safety: Standardizing PIVC Practices to Reduce Complications

Peripheral intravenous catheters (PIVCs) are widely used in hospital settings and are commonly inserted upon admission. While PIVCs provide convenient access to fluids and vital medications, they also pose significant risks to patient safety, hospital length of stay, nurse workload, and overall healthcare costs. Ineffective PIVC insertion and maintenance can ultimately lead to complications such as phlebitis, infiltration, extravasation, and other bloodstream infections (BSIs). The motivation for initiating this project comes from recognizing how often PIVCs are utilized in everyday nursing practice, and how inconsistent methods and PIVC management among staff can lead to preventable infection and patient harm. The problem identified was a lack of standardized, evidence-based practice education that nurses can rely on as a resource for the maintenance, care, and documentation of PIVCs. To address this problem, the project focused on implementing standardized PIVC care bundles and in-person education and training on PIVC insertion, care, and maintenance. Doing so promotes consistent, evidence-based practices by reducing variation and encouraging standardized use of PIVC materials. Implementing standardized PIVC insertion and maintenance bundles will help reduce PIVC-related complications and improve patient outcomes. The plan to measure this will be to monitor infection rates, gather staff feedback, evaluate adherence, and assess consistency. Analyzing these measures over time will help ensure that evidence-based practices are implemented effectively and thus reduce the risk of PIVC-related complications.

Spring Nursing Senior Design Projects

TEAM MEMBERS
Anika Khan
Christon Morgan
Neveah Sandoval

FACULTY ADVISOR
Dr. Amy Ketchum

Implementing a Holistic Pain Assessment Scale

Pain perception is influenced by complex factors such as individual experience, mental health, and coping skills. Standardized pain assessment tools currently being used in acute care settings often include single item scales that only address one factor. There are gaps in holistically approaching pain management with current standardized pain assessment tools. The Pain Catastrophizing scale allows for personalized pain plans that can then be developed to support the patient's post-operative pain management plan and minimize the occurrence of pain catastrophe.
This project proposes the implementation of this new tool to individualize pain assessment. The clinical question is: In adult orthopedic surgery patients, how does preoperative screening using the pain catastrophizing scale compared with standard pain screening tools improve postoperative perception of pain. Implementation steps will include nurse education, piloting of the new assessment tool and gathering feedback from clients over a three-month period. Resources needed for completion include coordination with clinicians, clients, and the electronic health record.

TEAM MEMBERS
Mia Hochstetler
Morgan Leipzig
Brooke Smith

FACULTY ADVISOR
Dr. Elizabeth Mounir

Enhancing Critical Care Nurse's Wellness Through Structured Debriefing

How do those caring for others care for themselves? The question of nursing wellness emerges as work-related stressors become increasingly complex and unpredictable. When these stressors, such as poor management, imbalanced staffing ratios, and inadequate compensation, overcome coping mechanisms, burnout occurs. This may manifest as emotional or physical exhaustion, which damages the overall well-being of nurses. This project seeks to examine specific ways in which systematic protocols and practices can enhance the multifaceted dimensions of nursing wellness in the face of unique and heavy challenges nurses face shift to shift, with a specific focus on debriefing. Debriefing after critical events is a way to show nurses that they are valued, provide support, foster psychological safety, enhance teamwork, and learn from mistakes in a positive way. Implementing a consistent debriefing practice will aim to enhance nursing wellness and create a better environment for all nurses. For nurses working in adult intensive care units (ICUs), how does structured debriefing after a patient's death affect nurses' psychological wellness compared to without debriefing?

TEAM MEMBERS
Lauren Jenkins
Violet Nehmer
Christopher Wilson

FACULTY ADVISOR
Dr. Elizabeth Mounir

Improving Postpartum Depression Screening and Establishing Referral Pathways in the Primary Care Setting

Women's mental health in the perinatal period is under-represented in medical research and experimentation. The purpose of this change project is to increase the rates of identification of postpartum depression (PPD) and subsequent mental health services referrals. Improved identification of PPD with the Edinburgh Postnatal Depression Scale (EPDS) is a necessary step to receiving treatment. Preventative care is essential to stave off chronic disease in vulnerable populations. Standard outpatient visits for postpartum mothers are scheduled for two and six weeks after delivery where nursing staff complete the EPDS. The clinical question remains: In postpartum women, does implementation of the Edinburgh Postnatal Depression Scale improve accuracy of identification of postpartum depression and subsequent mental health services referral?

TEAM MEMBERS
Katrina Wawrzyn
Jazmyn Lopez Gonzalez
McKenna Oettel

FACULTY ADVISOR
Dr. Cheryl L. Petersen

Transition to Adult Care for Type 1 Diabetes Patients

Adolescent patients with type 1 diabetes transitioning into an adult clinic often experience gaps in care, which can lead to poor patient engagement and appointment adherence, as well as decreased glycemic control. The purpose of this change project is to improve appointment adherence and blood glucose control throughout the transition from pediatric to adult care in patients with type 1 diabetes. This project aims to use a structured multidisciplinary team to support type 1 diabetes patients for three years surrounding this transition by providing necessary resources and support. The structured multidisciplinary team will be initiated in the pediatric endocrinology clinic and follow patients as they transition into the adult clinic. The measured outcomes include appointment adherence and hemoglobin A1c.

TEAM MEMBERS
Lesli Santiago
Danny Aranda
Sarah Vilardi

FACULTY ADVISOR
Dr. Cheryl L. Petersen

Pet Therapy to Minimize PTSD Symptom Severity in ED Nurses

The purpose of this project is to implement an eight-week pet therapy program in a Midwestern Level I trauma center to reduce post-traumatic stress disorder (PTSD) symptom severity in emergency department (ED) nurses diagnosed with PTSD. ED nurses are constantly exposed to traumatic events, thereby increasing their risk for PTSD, which negatively impacts their well-being and patient care outcomes. Research shows that pet therapy improves physiological and psychological well-being for individuals who have been through traumatic experiences. Pet therapy will provide an evidence-based approach to support ED nurses' psychological well-being. Nurses will engage in scheduled sessions with certified therapy dogs three times weekly for eight weeks. PTSD symptom severity will be measured before and after the intervention using the Clinician-Administered PTSD Scale for DSM-5 (CAPS-5).

TEAM MEMBERS
Hannah Casey
Ramiro Martinez
Jacob Rogers

FACULTY ADVISOR
Sara Keen

Preventing Postpartum Complications in Medicaid Dependent Women in Southeastern Wisconsin

The purpose of our project is to reduce postpartum complications in Medicaid dependent mothers, specifically in southeastern Wisconsin. Around 30% of women giving birth in Wisconsin have hypertension. (Kirwan, 2024). Patients enrolled in a remote blood pressure monitoring program were less likely to experience an adverse outcome in the first 6 months after delivery (Hirshberg, 2023). Without continued monitoring, patients are more likely to experience severe complications such as stroke, heart failure, or postpartum preeclampsia which can lead to emergency visits and hospital readmission. Providing automatic home blood pressure cuffs at or during discharge enables the patient and the healthcare team to identify worsening hypertension early and use preventive measures to ensure that the patient doesn't have to endure complications post-delivery. This intervention is specifically useful for populations facing barriers to follow up care including but not limited to, transportation, childcare, and loss of insurance.

TEAM MEMBERS
Joseph Cait
Martinez Kristin
Zubair Musfirah

FACULTY ADVISOR
Sara Keen

Implementing a Structured Opioid Educational Program

The clinical question designed to address bedside nursing opioid administration is as followed: among bedside nurses in post-surgical, acute inpatient floors, does implementation of a structured opioid education program compared to no additional education increase confidence in opioid administration? Implementation of a focused educational program, that is inclusive of bedside nurses who directly administer opioids can result in positive patient outcomes, at a local and greater population level. To implement an educational program, it requires a structured plan, active nurse participation, and access to applicable hospital units. This type of intervention is designed for key stakeholders that have a direct impact and involvement on nursing opioid administration. These key stakeholder groups include bedside nurses, nurse educators, and nursing management. The goal is to have a structured opioid targeted education program, on acute inpatient post-surgical hospital floors within a 12-month timeframe.

TEAM MEMBERS
Crismel Juan
Monica McDade
Christian Valente

FACULTY ADVISOR
Dr. Jane Paige

Improving Handoff Communication in the Inpatient Psychiatric Setting

This project focuses on the process for communication of shift handoff report within inpatient psychiatric care settings. The need for this project was identified from existing inefficiencies observed during handoff report in psychiatric care environments. Inefficient handoff report processes can potentially contribute to delays in patient care and communication of inaccurate information. To address these concerns, we propose implementing use of the handoff tool, I-PASS-the-BATON. The goal of using this tool is to improve clarity, quality, and efficiency of handoff reports by increasing consistency and ensuring pertinent information is communicated effectively at the beginning and end of each shift.

TEAM MEMBERS
Anuoluwa Adebayo
Maly Xiong

FACULTY ADVISOR
Dr. Jane Paige

Cultural Assessment Guide for Nurses

This project focuses on the development and proposed implementation of a structured cultural assessment guide designed for use by nurses during hospitalization. The purpose of this guide is to help nurses systematically identify patients' cultural beliefs, communication preferences, family roles, and health practices that may influence care. By incorporating guided cultural assessment questions into routine nursing assessments, the project aims to improve patient–nurse communication, increase patient trust, and reduce cultural misunderstandings. The project also includes an educational component that outlines how nurses would use the guide effectively and at appropriate times during patient care. Through reviewing existing literature and evidence-based tools, this project evaluates how structured cultural assessment can support culturally sensitive care and enhance patient-centered outcomes in diverse healthcare settings.

Physics and Chemistry Department

Chemical and Biomolecular Engineering Senior Design Projects

TEAM MEMBERS
Nicholas Akers
Kyarra Furman
Heather Schille
Maggie Spitzbarth
Maxim Strzelecki

FACULTY ADVISOR
Dr. Wujie Zhang

SPONSOR
MSOE Innovent Center
Seed Grant

Use Of C. necator Bacteria for the Production of PHA Polymer

Polyhydroxyalkanoates (PHA) are a class of biodegradable and biocompatible polymers that are an emerging prospect for the plastic industry due to desired chemical and mechanical properties. PHA can be produced by certain bacteria under specific conditions, and they have a high potential for scalability. Currently, the PHA industry is unable to stand up to the traditional plastics industry that have the benefit of scale, established infrastructure, and lower costs. This project aims to optimize the biosynthesis of biodegradable plastic, PHA, via the screening of different bacterial strains. Our goal at the start was to determine an effective PHA producing bacteria from the literature, optimize its growth, and validate the production of PHA. The long-term goal is a plastic alternative on the market that is more cost effective and capable of large-scale production, allowing bioplastics to compete with traditional plastics while also being more sustainable.

TEAM MEMBERS
Nathan Blanck
Mason Dopirak
Matus Dopirak
Akira Lebron
Karly Rickert

FACULTY ADVISOR
Dr. Wujie Zhang

EXTERNAL ADVISOR
Dr. Midelfort – DSM Firmenich

PHA Biopolymer Production Process Design

Our project focuses on developing a more economically feasible production process for polyhydroxyalkanoate, or PHA, which is a biopolymer that can be used for bioplastics. The process has been developed using SuperPro Designer, with intentional implementation of circular design elements, such as green solvent distillation that allows for reuse of the solvent, and waste stream repurposing, such as utilizing local brewers' spent grain as a carbon stream. Next steps are to complete the financial analysis using SuperPro Designer.

TEAM MEMBERS
Bennett Fleming
Brock Grahler
Dylan Hadfield
Brooke Stanley
Nicole Switalski

FACULTY ADVISORS
Dr. Eryn Hassemer
Dr. Nazieh Masoud
Dr. Faisal Shaikh

SPONSOR
Innovent Center

CAPture Healing

This project addresses the overall problem of optimizing wound healing within the clinical setting through the utilization of cold atmospheric plasma (CAP). CAP generates reactive oxygen species (ROS) and reactive nitrogen species (RNS), which have been proven to increase cell proliferation rates while killing bacteria. Specifically, this project addresses designing a CAP device that utilizes ambient air to decrease infection risks, optimize wound healing, and save millions of dollars within the healthcare industry.

TEAM MEMBERS
Jon Garcia
Owen Gendrich
Nikita Ostapchuk
Kaitlyn Radavich
Dolce Rusniaczek
Nefeli Tselemegkou

FACULTY ADVISORS
Dr. Jung Lee
Dr. Wuije Zhang

Building a Computational Pipeline for HIV-1 Entry Inhibitor Design

This project aims to create a computational pipeline for computational drug discovery work on HIV-1 virus using molecular docking and molecular dynamics simulations to identify the best drug candidates out of thousands of compounds available in public databases. The features of candidates are analyzed and iterated upon to create a more desirable binding profile to the HIV-1 proteins, potentially producing a drug capable of counteracting HIV-1 in one of the several steps of its infectious process.

TEAM MEMBERS
Billy Arps
Dani Becerra
Chase Cummings
Page Sanchez
Annika Zastrow

FACULTY ADVISORS
Dr. Faisal Shaikh
Dr. Sedar Ozturk

EXTERNAL ADVISOR
Dr. M. El-Halwagi
(Texas A&M University)

Grass to Gas

The project objective is to design a hydrogen pilot plant fueled by the consumption of biomass to address environmental concerns of current production methods. Hydrogen serves as an integral chemical in the chemical and refining industries, both of which are crucial to modern society and the economy. Due to the dwindling supplies of non-renewable energy sources and the drive for more environmentally sustainable solutions, hydrogen production derived from biomass has become an increasingly attractive solution. Our proposed pilot-plant solution utilizes biomass as a feedstock for hydrogen production along with carbon-capture technology to limit emissions from the process while maintaining economic feasibility. Techno economic analysis can be implemented to evaluate the economic feasibility and applicability of hydrogen production plants and help to identify where challenges could arise using various modelling techniques.

1025 N. Broadway
Milwaukee, WI 53202-3109
(800) 332-6763
msoe.edu