THE COLLEGE OF ENGINEERING, ARCHITECTURE AND TECHNOLOGY

SENIOR DESIGN Expo

NOVEMBER 22, 2024 | 8:00AM-4:30PM
ENDEAVOR LAB | 215 N. HESTER STREET.
STILLWATER, OK 74075

A MESSAGE FROM THE DEAN

GREETINGS!

It is once again that time in the semester for one of our most exciting days: Senior Design Expo Day! This is the day that our seniors work hard for all semester long. The expo gives all of us a chance to see the culmination of our students' education in engineering, architecture and technology throughout their time at OSU. It also gives us the opportunity to see the creativity and innovation of our students as they tackle real-world challenges in their projects.

During today's event, we will see architecture and architectural engineering students working together to design a speculative integrated arts facility for OSU's campus using sustainable designs. We will see civil engineering students seeking to create a safer environment for pedestrians with new designs for intersections and bridges and electrical and computer engineering students developing a wearable prosthetic device that can play guitar by integrating advanced control systems and adaptive design. Some mechanical and aerospace engineering and mechanical engineering technology students are even working on a project in anticipation of the 2028 Olympics in Oklahoma City. They are building an autonomous trash boat to clean up the Oklahoma River and lessen the need for man hours to keep the river clean. I am very much impressed by all that our students have accomplished, and I believe that you will be also.

Following the expo, we will award 199 degrees this semester. Our students leave OSU with the ability to lead companies, tackle complicated projects and be valuable contributors to their disciplines and society. The work our graduates do impacts all of us in some way. As we continue to grow our college, enhance our facilities and take on more collaborative efforts, we will only see this impact grow.

We could not do what we do without the support of OSU's senior leadership and the OSU State Regents for Higher Education, along with help from our many corporate partners, donors and the leadership teams within CEAT. Because of their support we can turn our students out into the professional world knowing that they will continue to spread the Land Grant mission of OSU through their innovative and creative solutions to real-world challenges and maximize the impact of OSU's excellence for the benefit of society.

I hope you enjoy our Senior Design showcase and getting to know our students. The future is *BRIGHT ORANGE* with these seniors as they enter into the workforce with the knowledge they have received here at OSU. These individuals go on to be leaders in their profession, problem solvers, trailblazers, philanthropists, civic leaders, entrepreneurs and mentors; leaving a legacy that will last a lifetime.

GO POKES!

DEAN HANCHEN HUANG

- Donald and Cathey Humphreys Endowed Chair
- Professor of Engineering

OSU - DESIGN PROJECTS

FRIDAY, NOVEMBER 22 FROM 8AM - 4:30PM IN THE ENDEAVOR LAB

ARCHITECTURE

(Projects located on the First floor of ENDEAVOR)

- Tradecraft Integrative Design Studio (1st Floor)

CIVIL AND ENVIRONMENTAL ENGINEERING

(Projects located on the *SECOND FLOOR* of *ENDEAVOR*)

- NOC Enid Pedestrian Bridge (2nd Floor)
- Sludge Removal System Design (2nd Floor)
- Intentional Walk Design (2nd Floor)

ELECTRICAL AND COMPUTER ENGINEERING

(Projects located on the *FIRST* and *SECOND FLOOR* of *ENDEAVOR*)

- Bio-inspired Pneumatic Hand (202)
- Digital Synchro Transmitter (202)
- Autonomous Firefighting Vehicle (Test Arena)

FIRE PROTECTION AND SAFETY ENGINEERING TECHNOLOGY

(Projects located on the *SECOND FLOOR* of *ENDEAVOR*)

- It's Not All Fun and Games, Virtual Reality Now Being Used For Hazard Identification (2nd Floor)
- A Fire in Paradise: An In-Depth Analysis of the 2018 Camp Fire (2nd Floor)
- Get a Grip: Fire Protection & Safety Hands-on Modules (2nd Floor)

INDUSTRIAL ENGINEERING AND MANAGEMENT

(Presentations will be from 1:30pm - 3pm in *ENGINEERING NORTH 310*)

- Facility Improvement for D&B Processing (EN 310)
- Forecasting Maintenance Technician Training for the FAA (EN 310)
- Revitalizing MPower's Revenue Streams (EN 310)

INTERDISCIPLINARY

(Projects located on the *FIRST, SECOND AND THIRD FLOOR* of *ENDEAVOR*)

- Cowboy Collector (Test Arena)
- Mach or Bust - Subscale Jet Engine Test Cell (Test Arena)
- Cyclone Cowboys - Collegiate Wind Competition (Test Arena)
- OTG Tiny House (220)
- Bullet's Tow (220)
- NaviRo IEEE Robotics (340)
- OKSat (340)

MECHANICAL AND AEROSPACE ENGINEERING

(Projects located on the *SECOND FLOOR* of *ENDEAVOR*)

- FlexRig (220)

MECHANICAL AND AEROSPACE ENGINEERING - OSU-TULSA

(Projects located on the *SECOND FLOOR* of *ENDEAVOR*)

- Sound Reduction (220)
- Plastic Folding (220)

MECHANICAL ENGINEERING TECHNOLOGY

(Projects located on the *SECOND FLOOR* of *ENDEAVOR*)

- Continuously Variable Displacement Engine (220)

COMPETITION TEAMS

(Projects located on the *FIRST FLOOR* of *ENDEAVOR*)

- Cowboy Rocketworks (Test Arena)
- Baja SAE (Cowboy Racing) (1st Floor)
- Formula SAE (Bullet Racing) (1st Floor)

MAE 3153 – ROBOT BATTLE – SQUARE PEG IN A ROUND HOLE

Competition to will be held on the ***SECOND FLOOR*** of ***ENDEAVOR*** from 1:30pm to 3:30pm.

THE AWARDS SHOW FOR ID/MAE/MET/EET AND ECE TEAMS WILL BE HELD IN THE CHICKASAW NATION STEM AUDITORIUM IN ENGINEERING SOUTH AT 4:30PM.

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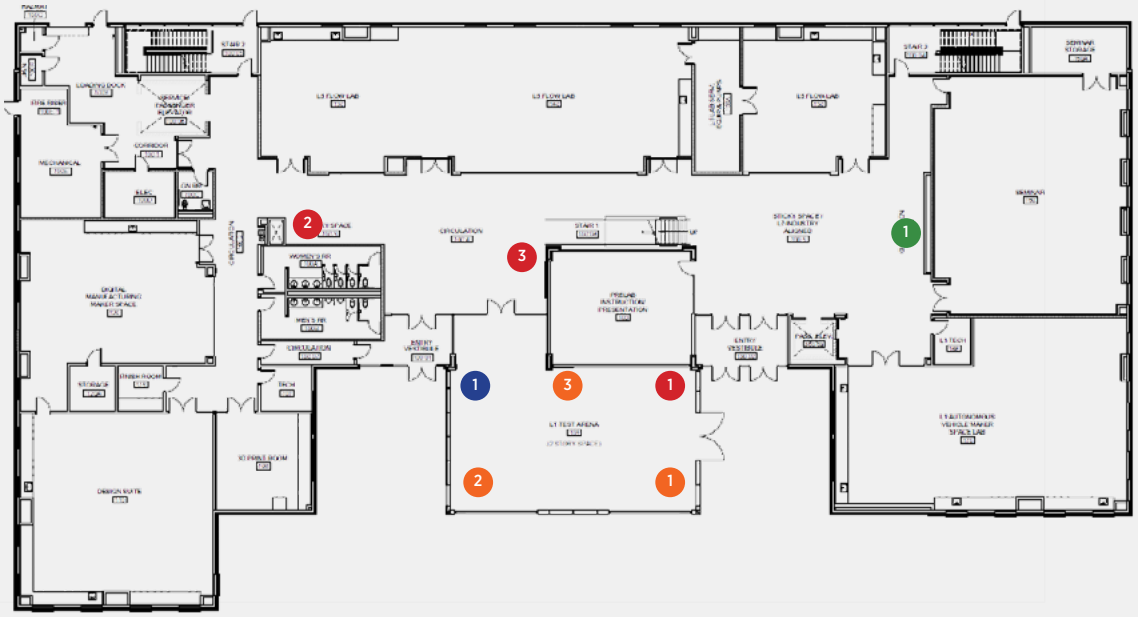
FIRST FLOOR ENDEAVOR



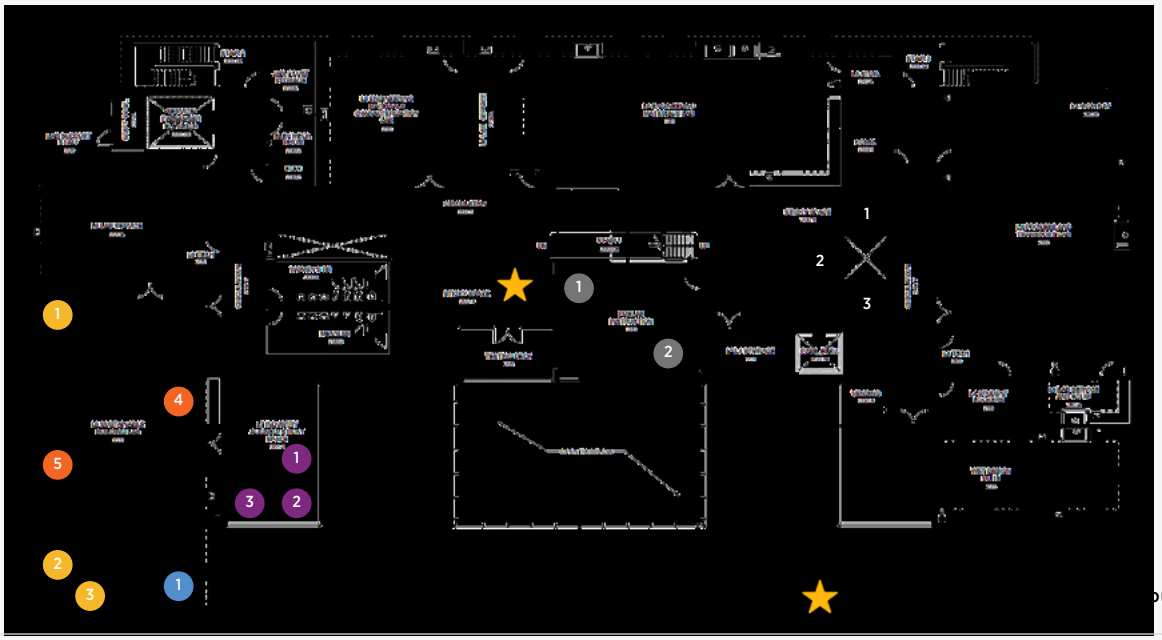
ECE
1. Autonomous Firefighting Vehicle

COMPETION
1. Cowboy Rocketworks
2. Baja SAE (Cowboy Racing)
3. Formula SAE (Bullet Racing)

INTERDISCIPLINARY
1. Cowboy Collector
2. Mach or Bust - Subscale Jet Engine Test Cell
3. Cyclone Cowboys - Collegiate Wind Competition

ARCH
1. Tradecraft Integrative Design Studio

SECOND FLOOR ENDEAVOR



ound Hole

INTERDISCIPLINARY
4. OTG Tiny House
5. Bullet's Tow

MAE
1. FlexRig
2. Sound Reduction
3. Plastic Folding

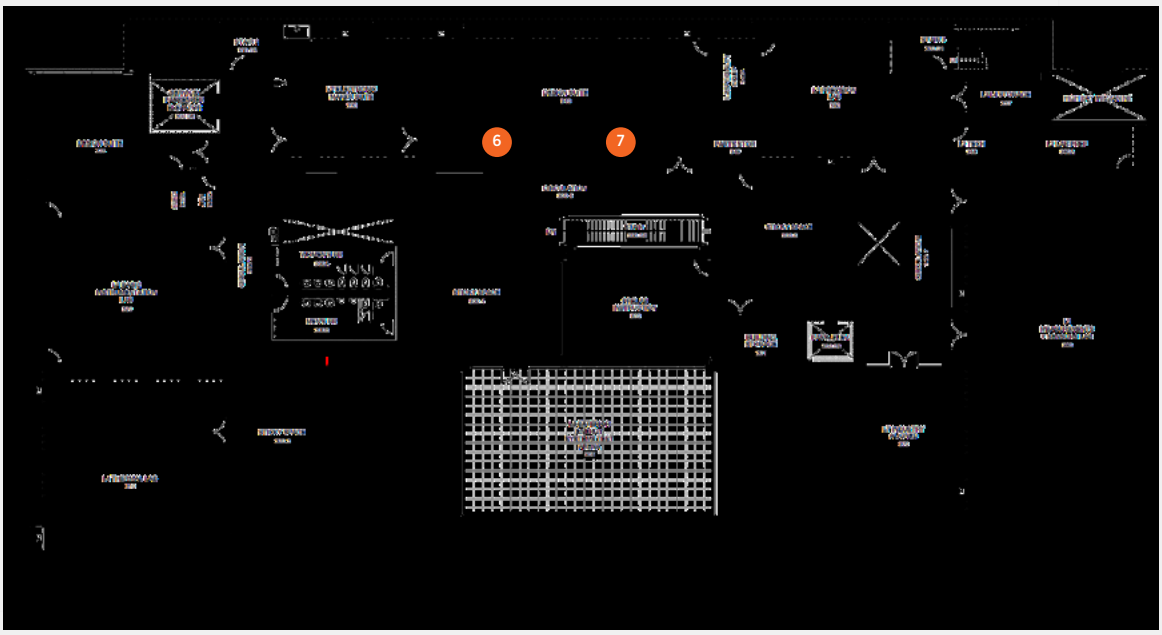
MET
1. Continuously Variable Displacement Engine

CIVE
1. NOC Enid Pedestrian Bridge
2. Sludge Removal System Design
3. Intentional Walk Design

ECE
1. Bio-inspired Pneumatic Hand
2. Digital Synchro Transmitter

FPSET
1. It's Not All Fun and Games, Virtual Reality Now Being Used For Hazard Identification
2. A Fire in Paradise: An In-Depth Analysis of the 2018 Camp Fire
3. Get a Grip: Fire Protection & Safety Hands-on Modules

THIRD FLOOR ENDEAVOR



INTERDISCIPLINARY
6. NaviRo IEEE Robotics
7. OKSat

ARCHITECTURE

ARCH

PROJECT TITLE

TRADECRAFT: INTEGRATIVE DESIGN STUDIO

In hopes of achieving an equitable, sustainable and a resilient future, the younger generation will have to continue the effort to transform the current fossil-fuel-intensive energy system to a non-polluting sustainable energy system. According to the most recent data published by the Energy Information Administration, buildings consume 74% of U.S. electricity, which represents 29% (21.9 quadrillion Btu) of delivered energy (not counting electrical system energy losses). Indeed, architecture is responsible for a significant portion of U.S. energy consumption. Architects and architectural engineers carry a heavy responsibility to design zero-energy buildings that avoid reliance on fossil fuels. This studio proposes meeting this achievable goal with a three-legged strategy which includes (1) energy load reduction, (2) electrification and (3) on-site and/or off-site electric generation from renewable sources. In the fall 2024 Integrative Design Studio, architecture and architectural engineering students are designing a speculative integrated arts facility for OSU's campus using sustainable design. The 15 submissions demonstrate unique design proposals that implement the strategy above by (1) achieving the lowest energy consumption possible, (2) designing buildings that are 100% electric and (3) exploring the potential of integrating PV systems with building form.

SPONSOR(S)

- RENEWABLE AND INNOVATIVE SUSTAINABLE ENERGY (RAISE) *Awareness in Engineering grant funded by the Martin Family Foundation*

ADVISOR(S)

Dr. Khaled Mansy, Prof. Keith Peiffer, Prof. Christina McCoy, Prof. Jay Yowell

(Left to Right) Emily Nikkel, Jaidyn Hess, Chase McClellan

(Left to Right) Kayla Ifekoya, Gaby Bernabe, Addison Hunt Hagar, D'Shaun Merriweather

(Left to Right) Christina Chahalis, Tabitha Ellis, Andrew Truong, Skylar Waters

(Left to Right) Abigail Richardson, Miranda Krebbs, Olivia Bailey, Rylan Flecker

(Left to Right) Maggie Carathers, Benjamin Freet, Evan McDonald, Caleb Toler

(Left to Right) Kasey Fuquay, Kale Hilburn, Christian Brack

(Left to Right) Emily Smith, Abbey Staudt, Ian Strickland, Stefan Jurca

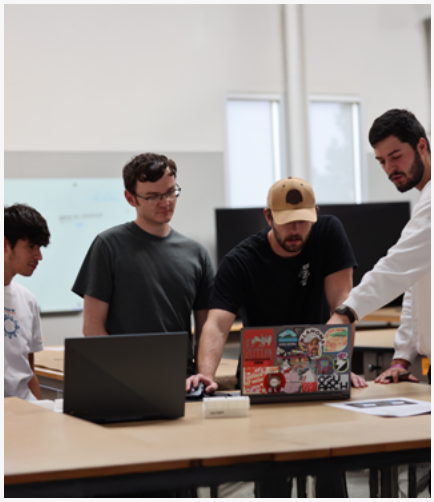
(Left to Right) Sophie Fetkovich, Brook Lyn Jones, Hazel Nansubuga, Braeden Duncan

(Left to Right) Ryan Thompson, Jackson Shipley, Hailey Schmidt, Jenkins Peek

(Left to Right) Presleigh Adams, Hannah Hembree, Dakota Copenhaver, Tyler Berryhill

(Left to Right) Allison Baker, Mattie Farve, William Patton, Justin Lay

(Left to Right) Thomas Raber, Kai Smith, Whitney Waitsman



(Left to Right) Jesus Fuentes, Jacob Gore, Logan Hamilton, Blake Portell

(Left to Right) Courtney Witt, Amber Johnson, Chris Burchett, Josh Duncan

(Left to Right) Emily Henderson, Mattia Braggion, Nick Morey (Not pictured: Jaylin Strub)

CIVIL & ENVIRONMENTAL ENGINEERING

CIVE

(Left to Right) Jonah Kramer, Jordan Pennon, Avery Acord

PROJECT TITLE

INTENTIONAL WALK DESIGN

Oklahoma State University is seeking to create a safer on-campus environment for pedestrians. The University is home to many students from in-state and out-of-state, which in return means high volumes of traffic. After a recent series of unfortunate incidents including crashes and near-misses, OSU has taken the initiative to form a Pedestrian Safety Task Force. Multiple problem areas have been identified on campus characterized by concentrations of collision data. After evaluating available data, the design team has identified a singular location that exhibits common issues seen around campus and has no current plans for improvement. This selected area of interest is the intersection of Cleveland Street and Farm Road. Multiple facilities showing a high volume of pedestrian traffic are located nearby. To improve comfort for everyone, the design team plans on redesigning the entire intersection into a shared space.

ADVISOR(S)

Dr. Norb Delatte

SPONSOR(S)

- STEVE SPRADLING *(Head of Pedestrian Safety Task Force at Oklahoma State University)*

CIVE

(Left to Right) Cade Anderson, Morgan Henson, Della Thomas, Austin Mills

PROJECT TITLE

NOC ENID PEDESTRIAN BRIDGE DESIGN

The Northern Oklahoma campus, located in Enid, Oklahoma, has a 3-acre stormwater retention pond situated on the campus with a stream that is connected. Located downstream are three pedestrian bridges in poor condition. The team is tasked with designing replacements for each bridge.

ADVISOR(S)

Dr. Paul Tikalsky, Dr. Mohamed Soliman, Nisha Bhatta

SPONSOR(S)

CIVE

(Left to Right) Harrison Trumble, Autumn Burns, Kirsten Albert, Abdulrahman Hujailan

PROJECT TITLE

SLUDGE REMOVAL SYSTEM DESIGN

The OSU water treatment plant's sedimentation tanks cannot handle the amount of sludge being produced. This is a result of a very inefficient design. Ideally, sludge would move down the basins' slope into the raking/drainage system, but the sludge is settling quickly and becoming anaerobic. This results in the basins needing to be drained quarterly to clean all of the sludge, a very time consuming and labor-intensive task. We are designing a sludge removal system that will be implemented into the sedimentation basins. This will increase sludge removal and reduce maintenance needed on the basins.

ADVISOR(S)

Dr. Greg Wilbur

SPONSOR(S)

- OKLAHOMA STATE UNIVERSITY WATER TREATMENT PLANT


ELECTRICAL & COMPUTER
ENGINEERING

ECE

(Left to Right) Millyan Stinson, Mohammed Sheshtar, Ben Sailor

PROJECT TITLE

AUTONOMOUS FIREFIGHTING VEHICLE

Our team's overall objective is to improve and expand upon the autonomous firefighting vehicle which began in the fall of 2022. The ultimate goal of the project is to autonomously navigate, locate and fully extinguish an area engulfed with fire. The AFV achieves this by following the plan outlined below:

1. Receive general location of fire from ground station
2. Approach fire using path planning algorithm autonomously such as MPC
3. Plan best direction of attack via FLIR camera and image processing software
4. Extinguish fire with foam/water launching turret
5. Return to ground station

ADVISOR(S)

Dr. Joe Conner, Prof. Nate Lannan

ECE

(Left to Right) Lexi Patterson, Nathan Bremer, Garret Page

PROJECT TITLE

BIO-INSPIRED PNEUMATIC HAND

This project aims to develop a wearable prosthetic device designed to enable users to play an unmodified standard guitar under normal conditions without external assistance. The device will replicate the intricate hand movements required for guitar playing, focusing on precision, flexibility and responsiveness. By integrating advanced control systems and adaptive design, the prosthetic will allow users to perform seamlessly, providing a natural and intuitive experience comparable to that of a biological hand. The final outcome will enable users to engage with musical instruments in an unrestricted manner, restoring or enhancing their ability to play.

ADVISOR(S)

Dr. Scott Mattison, Prof. Nate Lannan

ECE

(Left to Right) Mohammed Ali, Caleb Hadley, Timothy Miller

PROJECT TITLE

DIGITAL SYNCHRO TRANSMITTER

We are creating a digital version of a synchro transmitter. This allows a direction on a host PC, which will cause a physical synchro receiver to rotate to the direction.

CymSTAR, the company that has sponsored our project, uses digital synchros to simulate airplane flight instruments.

ADVISOR(S)

Dr. Pejman Ghasemzadeh

SPONSOR(S)

CymSTAR

FIRE PROTECTION & SAFETY ENGINEERING TECHNOLOGY

FPSET

(Left to Right) Brookelyn Conner, Kade Bodily

PROJECT TITLE

A FIRE IN PARADISE: AN IN-DEPTH ANALYSIS OF THE 2018 CAMP FIRE

The outburst of wildland urban interface fires (forest fires backed to urban interface or WUI) has only been growing in the recent years, and the need to get to the root cause of why these fires become as devastating as they do grow as well. These communities that are at higher risk are surrounded by forests, known as WUI. In order to find underlying root issues, a cause-and-effect tree needs to be made on an in-depth analysis of at least one of these fires. The fire chosen is the deadliest fire that California has seen, the 2018 Camp Fire. This fire struck the town of Paradise, California. The town suffered the loss not only of property and environment, but also of human life. Data from this fire will help determine possible linked causes, and in turn, can be analyzed for similar communities in order to stop the risk of these WUI fires. Documents from the National Institute of Standards and Technology, as well as several video documentaries of the 2018 Camp Fire will be utilized to create the cause-and-effect tree. The tree will outline standards that other WUI communities can follow to prepare for and mitigate wildfires.

ADVISOR(S)

Dr. Haejun Park

FPSET

(Left to Right) Xinrui Du, Michelle Ross, Parker Wallace

PROJECT TITLE

GET A GRIP: FIRE PROTECTION & SAFETY HANDS-ON MODULES

This project involves creating three hands-on interactive modules to gain engagement and knowledge retention from potential students of the Fire Protection and Safety Engineering Technology Program. Engagement at fairs and events is sometimes difficult to obtain with new generations of students and modern technologies. Not having modules that potential students would learn from causes fewer students to enroll in a high-demand career field. The approach to solve this issue was figuring out the best ways for students to learn and retain knowledge through hands-on modules. Modules were chosen based on an online survey that was provided to FPSET students and staff; resulting in Forklift, Fire Extinguisher and 3D Seek-N-Find content being selected. Using observational data from the FPSET and CET 1213 class indicates which aspects of the modules were successful. Presenting at such events, an increase in attraction rate for the FPSET table and a deeper understanding of the program for students is predicted. The key impact of this project is to help potential students learn and retain more using hands-on modules to potentially grow the FPSET Program.

ADVISOR(S)

Dr. Virginia Charter

SPONSOR(S)

FPSET

(Left to Right): Caleb Case, Bailey Magill

PROJECT TITLE

IT'S NOT ALL FUN AND GAMES, VIRTUAL REALITY NOW BEING USED FOR HAZARD IDENTIFICATION

Virtual-reality, used in an educational setting, is being implemented to allow online students to have lab experiences in identifying occupational hazards and concerns. Fire Protection and Safety Engineering Technology at Oklahoma State University is seeking ways to make hands-on lab activities available for students choosing to pursue an online degree. The online degree is newly available, and it is necessary to give online students the same learning opportunities as students who choose to study in-person. Three-dimensional scans of sites were created and uploaded to virtual-reality and computer-viewing software and were used as a tool for online students to be tested on their ability to identify hazards. The virtual-reality and computer based students' testing results were compared statistically to students who attended the same site in-person. The finished research will allow FPSET to continue implementing labs in the online program and give future students the best chance to be successful in their education, specifically for occupational hazard identification.

ADVISOR(S)

Dr. Diana Rodriguez Coca

INTERDISCIPLINARY

MAE | MET

(Left to Right) Antonio Valencia, Reece Hicks, Nicolas Jolin, Jace Brownlee, Austin Brown

PROJECT TITLE

COWBOY COLLECTOR

In anticipation of the 2028 Olympics, a private group wants to sponsor OSU to design and build an autonomous trash boat to clean up the Oklahoma River in Oklahoma City. This semester we are working on a proof-of-concept that can be improved and added onto. Our team has the opportunity to lower the amount of trash in the main river and lower the need for human interaction to clean up the surface of the river.

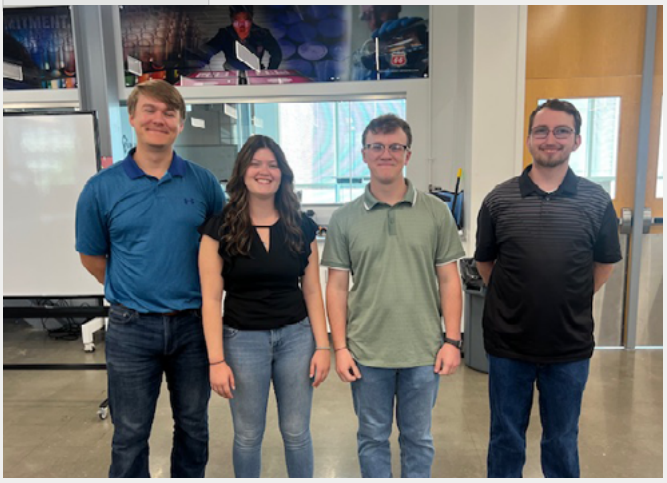
LINK(S)

1. Video Presentation

ADVISOR(S)

Dr. Aaron Alexander, Dr. Mark Krzmarzick

ECE | MAE



(Left to Right) PJ Murphy, Cassie Penick, Lucas Sager, Matt McCornack

PROJECT TITLE

OKSAT

OKSat is an ongoing senior design project with the mission to develop a space mission to demonstrate functionality of a novel small form factor optical receiver. The vessel for this space mission is a 3U CubeSat, where the optical receiver is a 1U form factor optical payload. For reference, a U has the standard dimensions of 10 centimeters long, 10 centimeters wide and 10 centimeters tall. In previous semesters, many of the materials, such as the optical receiver, have been developed, purchased and/or chosen leading into the fall semester of 2024. The tasks for this semester's senior design team have been split for the two disciplines that make up the team: mechanical engineering and electrical and computer engineering. The ECEs are tasked with demonstrating the ability to program the on-board computer through a mock-up mission control as well as use a transceiver to send and receive data. During the semester, they will also record their processes of running programs and software in order for future senior design teams to refine their codes and update them for their needs. The MEs will be working on developing a more accurate CAD model of the CubeSat that will be used during the mission to provide real weights and material properties. From this CAD model, access will be gained to ADCS modeling software and hardware. Finally, an orbital model will provide the position over time as well as a temperature model of the CAD model throughout its orbit, which is demonstrated preferably with active pointing.

LINK(S)

1. Website | 2. Video Presentation

ADVISOR(S)

Dr. John O'Hara, Tyler Graham

SPONSOR(S)

- MR. JACK H. GRAHAM, OSU ECE ALUMNUS

ECE | EET | IEM | MET

(Left to Right) Front Row: Maddie Holland, Jonah Collins, Brendan Craig, Ethan Brown, Second Row: Evan Quinton, Andy McEvoy, Third Row: Mason Quinton, Kris Barton, Back Row: Corbin Smith, Hunter Moeller, Brian Pavel, Not Pictured: Jeremy Cook

PROJECT TITLE

CYCLONE COWBOYS - COLLEGIATE WIND COMPETITON

For our project, we are competing in the DOE Collegiate Wind Competition. This requires designing and fabricating a fully functioning, self-sufficient wind turbine that abides by the strict rules and regulations of the competition. The other portion of the competition includes researching and pitching a hypothetical wind farm and doing extensive outreach events to make connections within the wind industry. It is a two-semester project that will culminate in Phoenix, Arizona, where each of these competition aspects will be judged and a winner will be announced. Our specific goals for this semester were building a new Vertical-Axis Wind Turbine concept, creating the floating base for the turbine, designing a variable load for use in both the VAWT and HAWT turbines, improving the electrical boxes and circuitry, and exploring different generators to optimize our turbine for the competition.

ADVISOR(S)

Prof. Nate Lannan

LINK(S)

1. Video Presentation

SPONSOR(S)

NEXTera ENERGY enel

ECE | MET

(Left to Right) Nate Craig, Cauy Brooks, Ricardo Cruz, Quetz Lujan

PROJECT TITLE

NAVIRO IEEE ROBOTICS

This project is to design and manufacture a small autonomous firefighting robot fit to given constraints. The completed robot will be used to compete in a competition during the spring 2025 semester.

ADVISOR(S)

Dr. Daqing Piao, Prof. Laura Southard, Prof. Nate Lannan

LINK(S)

1. Video Presentation | 2. Contest Rules

MET | ME

(Left to Right) Ryan Ellis, Magnus McKee, Aaron Haskell, Cong Kong

PROJECT TITLE

BULLET'S TOW

The purpose of our project is to create a device that will stop decoupling of the trailer from the Curt Rebellion hitch under normal towing conditions. We are creating something simple, economical and universal for most any trailer.

ADVISOR(S)

Joel Quarnstrom, Joe Reed, Mason Caillet

LINK(S)

1. Video Presentation

SPONSOR(S)

SAFETY TOW

MET | ME

(Left to Right) Truett Fowler, Mason Belflower, Patrick Osborn, Andrew Knotts, Joshua Ballard, Jesse Carlson

PROJECT TITLE

MACH OR BUST – SUBSCALE JET ENGINE TEST CELL

For OSU jet engine research, we are building a demonstrator test cell capable of testing a small-scale turbine test cell that is easily modified.

ADVISOR(S)

Dr. Aaron Alexander, Dr. Kurt Rouser, Prof. Laura Southard

LINK(S)

1. Video Presentation

EET | MET | EE | ME

(Left to Right) Garon Kourt, Sam Shuster, Eduardo Benitez-Mejia, Daniel Windle, Dmitry Vodnev, Chase Skokos, Brian Douglas, Josh Marshall, Ahmad Alshemeri, Adam Mason, Ralqattan Alqattan

PROJECT TITLE

OTG TINY HOUSE

OTG has been tasked with continuing the design and fabrication of a Zero Energy Tiny House. The house is equipped with solar power and thermal energy storage technology. The goal is to create a tiny house that can be fully self-sufficient, without requiring power from the electrical grid. This semester, OTG will design and fabricate a carport-like structure to support all necessary solar panels, optimize and install an HVAC system within the tiny house trailers and install a controls & instrumentation system that will allow for data acquisition of a single-tank system.

ADVISOR(S)

Dr. Jeffrey Spitler, Dr. Ying Zhang, Dr. Aaron Alexander, Prof. Ellis Nuckolls, Gabriel Parker, Pouria Moghimi-Ghadikolaei

LINK(S)

1. Video Presentation

SPONSOR(S)

CENTER FOR INTEGRATED BUILDING SYSTEMS
College of Engineering, Architecture and Technology

INDUSTRIAL ENGINEERING & MANAGEMENT

IEM

(Left to Right) Liam Nell, Yaqoub Alkandari, Elizabeth Berk, Karman Archie

PROJECT TITLE

FACILITY IMPROVEMENT FOR D&B PROCESSING

Our project aims to recommend optimal solutions to the paper-based information system currently in place at D&B Processing. Each recommendation will provide cost and benefit analysis, allowing for the client to choose the best option for their production flow.

ADVISOR(S)

Dr. Sri Ramesh

IEM

(Left to Right) Melissa Mata, Jordan Wheeler, Simon Antaya

PROJECT TITLE

FORECASTING MAINTENANCE TECHNICIAN TRAINING FOR THE FAA

One of the missions of the FAA is to maintain and operate air traffic control and navigation systems, as they work out of the Department of Transportation. The FAA has roughly 75,000 pieces of equipment in 400 locations across the continental U.S. employing nearly 5,000 maintenance technicians. The primary training facility for FAA maintenance technicians (MT's) is in Oklahoma City at the Mike Monroney Aeronautical Center, where the MT's are trained in one of five main categories. Currently, the FAA does not have a formalized process to forecast and plan for maintenance technician training more than a year in advance, which limits its ability to adequately prepare for future workforce and training needs. The Office of Inspector General (OIG) also works out of the DOT but conducts their own independent investigations and audits. The OIG released a report in 2023 which covered opportunities for the FAA to strengthen its workforce planning & training processes for maintenance technicians.
The Senior Design Team will use existing FAA data to build a forecasting model that accurately predicts future hiring trends and employee attrition. This model will serve as a tool that will improve the FAA's ability to meet maintenance technician training needs and increase the number of technical operations facilities that meet training requirements.

ADVISOR(S)

Dr. Austin Buchanan

IEM

(Left to Right) Ben Vise, Alan Meenan, Tristen Fisher

PROJECT TITLE

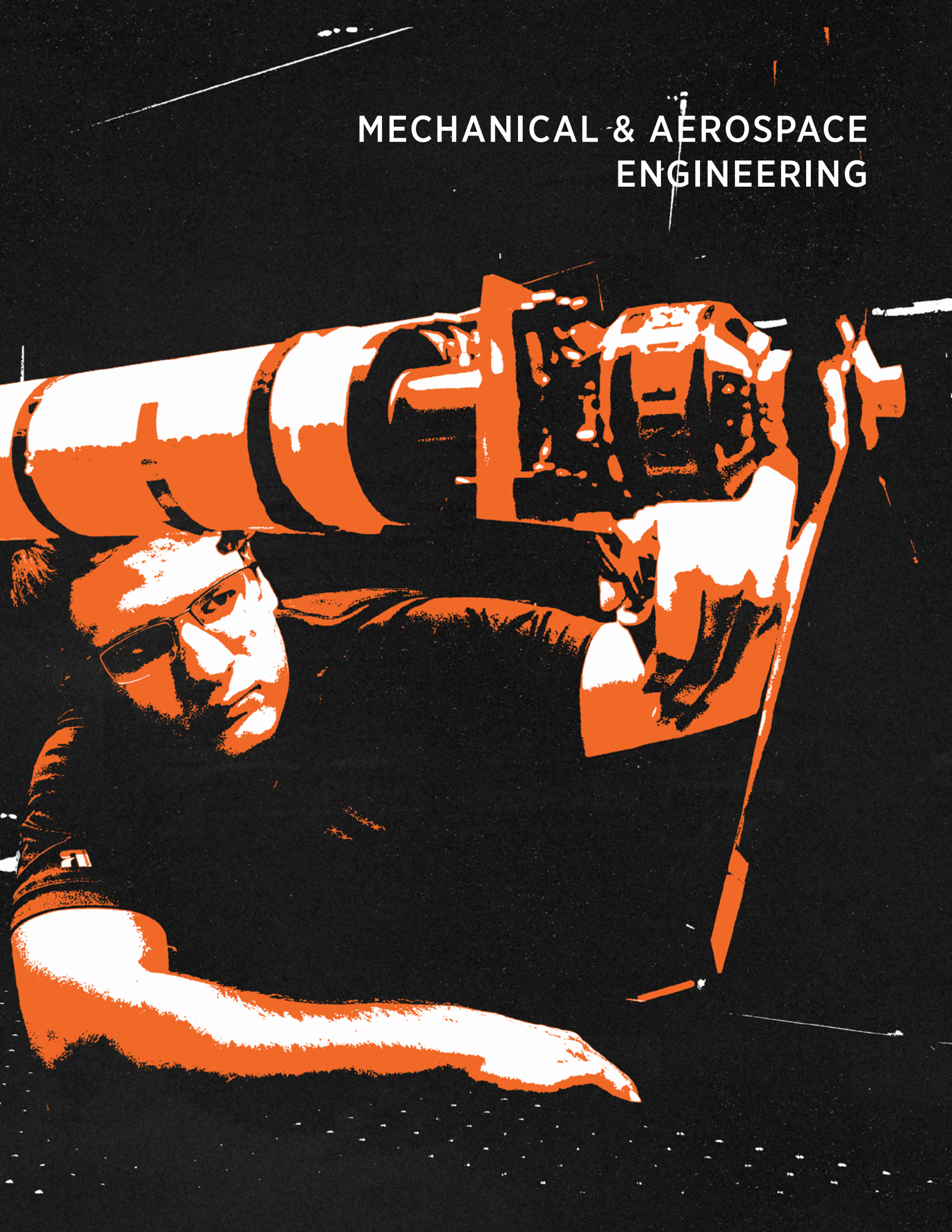
REVITALIZING MPOWER'S REVENUE STREAMS

The objective of this project is to drive revenue growth by developing and improving existing revenue streams within MPower. The senior design team will work to provide tools and strategies that will make MPower's exisiting operations more streamlined and profitable.

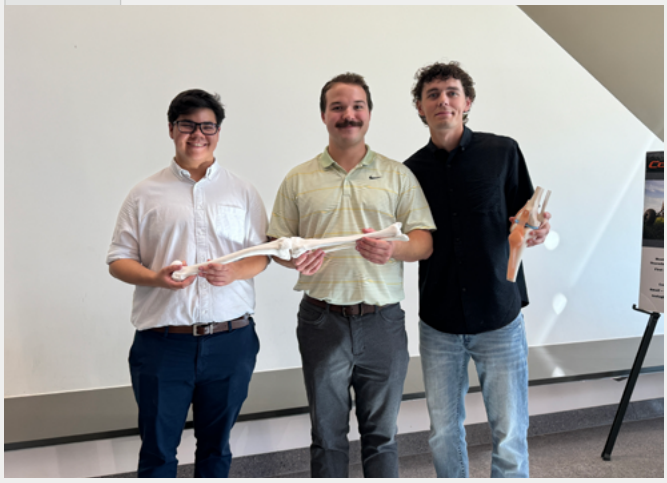
ADVISOR(S)

Dr. Pratima Saravanan

MECHANICAL & AEROSPACE ENGINEERING



MAE



(Left to Right) Nathan Ong, Jack Haines, Joshua Clark

PROJECT TITLE

FLEXRIG

The patellar tendon is the tissue that connects the patella (kneecap) and the tibia. If torn once, it is much more likely to tear again. To mitigate this risk, orthopedic surgeons Dr. Hanson and Dr. Checketts at OSU Medical Center - Tulsa developed a novel surgical technique to better repair the tendon. FlexRig's purpose is to validate this technique by designing and fabricating a machine capable of positioning a cadaveric knee at various flexion angles while accurately measuring the strain on the patellar tendon.

LINK(S)

1. Video Presentation

ADVISOR(S)

Dr. Jerome Hausselle

SPONSOR(S)

The ORTHOPAEDIC CENTER

OSU MEDICAL CENTER


MECHANICAL & AEROSPACE
ENGINEERING - OSU-TULSA

MAE OSU-TULSA

(Left to Right) James Schiermeyer, Tanner Davis, Taylor Sunday, Stuart Duvall

PROJECT TITLE

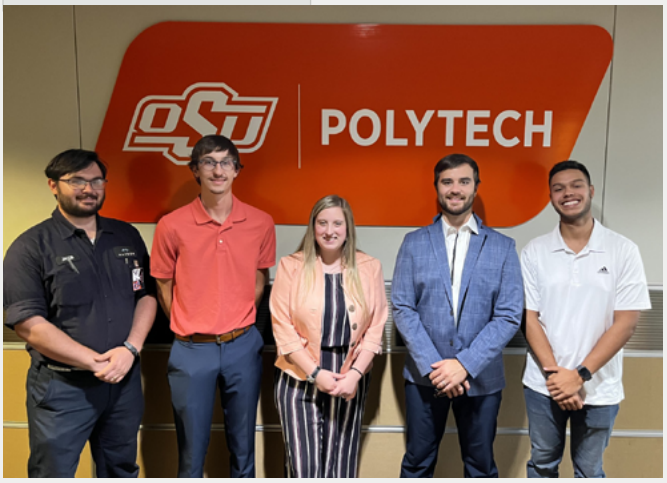
SOUND REDUCTION

The goal of our project is to design and test a device that can contain and slow the release of dynamic pressure waves, making them quieter. By using a unique geometry, we aim to control the response and minimize, or even benefit from, possible secondary effects. Simulation tools were used to validate performance to minimize iterations of prototypes.

ADVISOR(S)

Dr. Jay Hanan, Chris Scott

MAE OSU-TULSA



(Left to Right) Jake Carlson, Braden Key, Aubrey Burton, Alec Wigton, Jose Bastidas

PROJECT TITLE

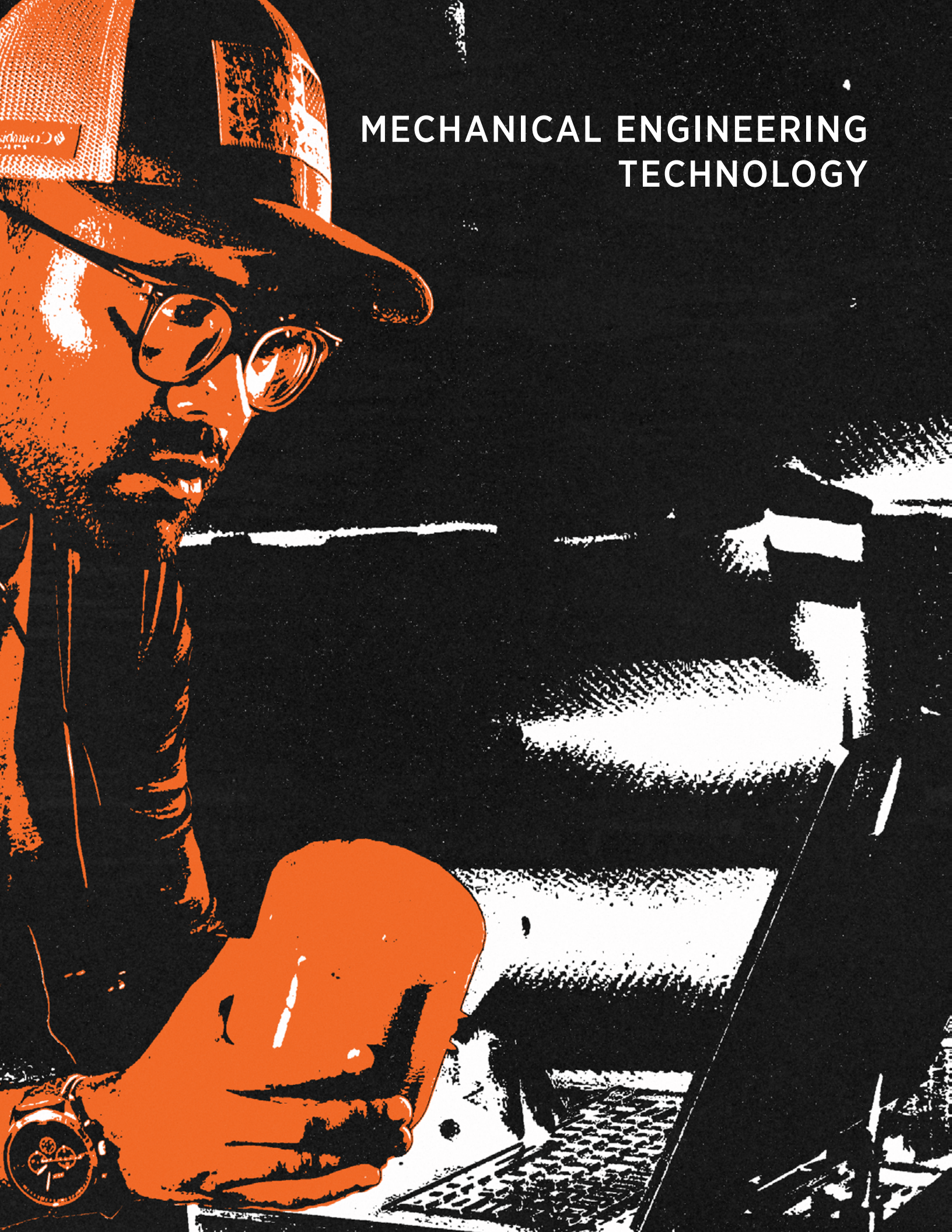
PLASTIC FOLDING

This team was tasked with designing a folding system that could integrate into an existing process. The folding system will incorporate novel concepts provided by the industry partner. The team used 3-D printing for prototyping and testing and plans to create a working test device that will demonstrate the expected reduction in complexity of the process. If successful, the concept could be implemented in future manufacturing processes.

ADVISOR(S)

Dr. Jay Hanan, Zachary Cain

MECHANICAL ENGINEERING TECHNOLOGY



MET

(Left to Right) Dax Yosten, Jayden Wall, Ian Gresley, Jack Chartier

PROJECT TITLE

CONTINUOUSLY VARIABLE DISPLACEMENT ENGINE

This project is aimed to design a cylinder head for a 7-cylinder continuously variable displacement engine. Utilizing design sketches and models of the engine body, the dimensions and placements of the cylinders were replicated on the cylinder head face. Through research and consultations with the client, the design started to take form. The first subsystem design was the planetary gear and cam assembly, which features a 4:1 ratio and a cam lobe with a fixed duration. Following this, the worm gear was designed, along with a method for its actuation. The third component was the cylinder head body itself, designed with a hemispherical combustion chamber and a side-by-side valve layout. Finally, the valve and rocker assembly were created; sticking to tradition, this assembly is fully mechanical. All these designs were developed in SolidWorks and will soon be 3D printed for demonstration and to evaluate their fitment.

LINK(S)

1. Video Presentation

ADVISOR(S)

Dr. Dan Fisher, Dr. Aaron Alexander, Ray Lucas

SPONSOR(S)

AmeriBand LLC


COMPETITION TEAMS
Cowboys
BOEING
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Hoosier
NISHIMOTO
DW
71

COMPETITION TEAM

PROJECT TITLE

COWBOY RACING

Cowboy Racing is Oklahoma State University's Baja SAE offroad racing team. Founded in 1995, this team has produced some of the most successful Baja-style vehicles. This student-governed team is open to all majors at OSU and seeks to develop the most industry-prepared students. Competitions occur throughout the United States and worldwide, fostering high levels of innovation within each team. Cowboy Racing recently excelled in competitions in California and Michigan, achieving overall scores that surpassed many of the top teams in the world. The team will be headed to Maryland for their 2025 competition!

Senior design projects are a key element of the Cowboy Racing team. Next semester, the team will investigate improvements to their four-wheel drive system by developing an active front differential, enhancing driveline components and maximizing material properties.

COMPETITION TEAM

PROJECT TITLE

BULLET RACING

At Bullet Racing, we are committed to designing, building and competing with state-of-the-art Formula SAE vehicles while embracing the Cowboy Culture. Bullet Racing offers students valuable hands-on experience in engineering, project management and teamwork, equipping them for success in their future careers. This multi-discipline team encapsulates 60+ members, over seven represented majors and eight different sub-systems. We will be attending the 2025 Formula SAE Michigan competition in May.

Next spring will usher in a new era of racing at Oklahoma State University. Senior members of Bullet Racing will begin developing the first electric FSAE racecar at OSU. This senior design project will focus on improving aerodynamic performance while exploring how these aerodynamic elements can serve as essential cooling devices for electric components.

COMPETITION TEAM

PROJECT TITLE

COWBOY ROCKETWORKS

Cowboy Rocketworks ignites a passion for rocketry through hands-on design, manufacturing and assembly. Established in 2016, our club focuses on participating in the Argonia Cup, researching high-altitude flights, and promoting personal development in professionalism and understanding of high-powered rocketry. We aim to achieve new heights as our program starts the development of space-bound rockets.

Senior design competitions are central to our team as we have a capstone project each year. This capstone team will compete for the Argonia Cup and will advance the student organization's research efforts.