COLLEGE OF
ENGINEERING, ARCHITECTURE AND TECHNOLOGY

SENIOR DESIGN EXPO

Fall 2023 Team & Projects Guide

Friday, December 1
8:00a.m.-5:00p.m.
ENDEAVOR Lab
215 N. Hester Street,
Stillwater, OK

Sponsored by

Google

Presentation Schedule

OSU-STILLWATER PROJECTS

Friday, December 1 from 8:00 AM - 5:00 PM in the ENDEAVOR Lab (Stillwater, OK)

CIVE (Projects are located on the Second Floor of ENDEAVOR.
Presentation times for CIVE projects are from 10 a.m. - Noon.)

(CIVE) WERC Environmental Design Contest (2nd Floor)
(CIVE) TEAM S.A.D. – Stillwater Airport Development (2nd Floor)
(CIVE) Pioneer Tech Flood Management Design (2nd Floor)
(CIVE) More than a Trickle Design Squad (2nd Floor)

ECE (Projects are located on the Third Floor of ENDEAVOR)

(ECE) CubeSat Ground Station (ENDV 340)
(ECE) Ethernet to Synchro Receiver Device (ENDV 340)
(ECE) Random De-Random Bot (ENDV 340)
(ECE) Cray Supercomputer (3rd Floor)
(ECE) Not To Bragg (ENDV 340)
(ECE) Drop-In Semiconductor Tester (3rd Floor)

FPSET (Projects are located on the First Floor in ENDEAVOR)

(FPSET) Investigating Gusset Plates in Fire (1st Floor)
(FPSET) America's Greatest Homecoming (1st Floor)
(FPSET) Christmas Tree Burn (1st Floor)
(FPSET) Safety Committee: Keys to Success (ENDV 150)
(FPSET) SNL Code Analysis (ENDV 150)
(FPSET) Impulse Noise Maker (ENDV 150)

IEM (Projects are located on the Third Floor in ENDEAVOR)

(IEM) Facility Layout Plan for Agapé Mission (3rd Floor)
(IEM) Thermal Specialties (3rd Floor)
(IEM) Improving Patient Satisfaction at Stillwater Pediatrics (3rd Floor)

Interdisciplinary (Projects are located on the First, Second and Third Floors in ENDEAVOR)

(ID) Tractor Beam (In Front of ENDEAVOR and Test Arena)
(ID) Home Efficiency Solutions (Energy Deck)
(ID) Super Servos (ENDV 220)
(ID) Sheath (ENDV 220)
(ID) IGVC Self Drive Team Joyride (Test Arena)
(ID) Autonomous Firefighting Vehicle (Test Arena)
(ID) Cyclone Cowboys (1st Floor)
(ID) Skyrail (RATO Bracket) (In Front of ENDEAVOR and Test Arena)

MAE (Projects are located on the Second Floor in ENDEAVOR)

(MAE) MAKO Eclipse (2nd Floor Balcony)
(MAE) The Tinkerers-CSAM Predictive Tool (ENDV 220)
(MAE) Robot Wars (2nd Floor)

MET (Projects are located on the First and Second Floor in ENDEAVOR)

(MET) Boeing Landing Gear Design Team (Test Arena)
(MET) Locomotors – Soft Pneumatic Robot (1st Floor)
(MET) Solar Panel Cleano/CES Team (ENDV 220)

OSU-TULSA Projects

OSU-Tulsa will be joining with OSU-Stillwater for the expo this semester.
You can find their projects on the Second Floor of ENDEAVOR.

MAE (Projects are located on the Second Floor of ENDEAVOR)

(MAE) Wearable Oxygen Concentrator (ENDV 220)
(MAE) Ecotwist: Sustainable Bottle Caps (ENDV 220)

Competition Cars (The Competition Cars are located on the First and Second Floor of ENDEAVOR)

(COMP) Baja (2nd Floor)
(COMP) Formula (1st Floor)

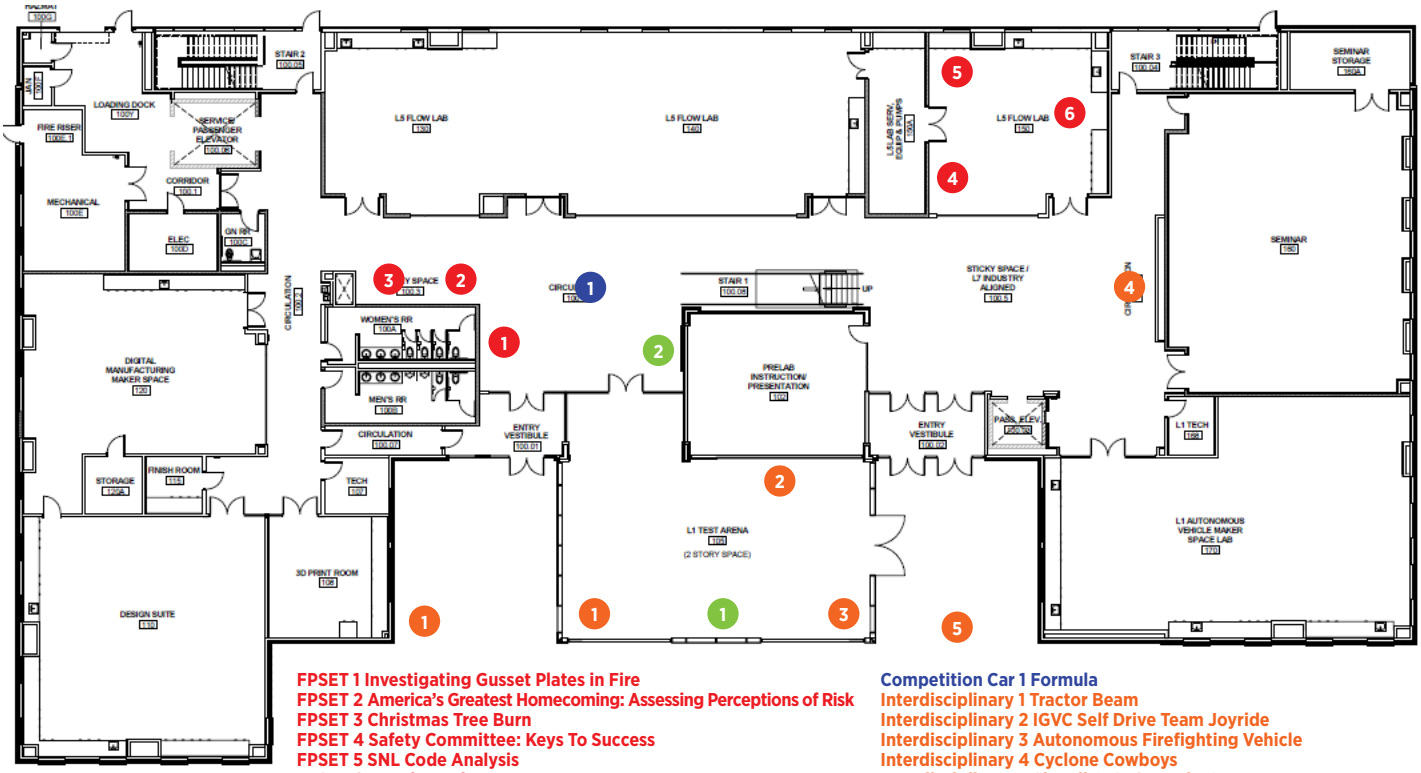
The awards presentation for ID/MAE/MET and ECE teams will be held in ENDEAVOR in Room 160 at 4:30 PM.

BAE Senior Design Presentations will be held the week of December 5-December 8 in Ag Hall

(BAE) Design of the sump tanks and fish nursery for the aquaponics system (8:30am-10:30am Tuesday, December 5) (225 AGH)
(BAE) Effluent water processing design options (11:30 AM-1:30 PM on Wednesday, December 6) (225 AGH)
(BAE) Design of a small-scale air blast pecan cleaner (1:00 PM-3:00 PM on Thursday, December 7) (225 AGH)
(BAE) Design of a "Smart" composting toilet (10:30 AM-12:30 PM on Friday, December 8) (122 AGH)
(BAE) Design of a weather and crop monitoring wireless sensor system (2:00 PM-4:00 PM on Friday, December 8) (122 AGH)

Project Locations

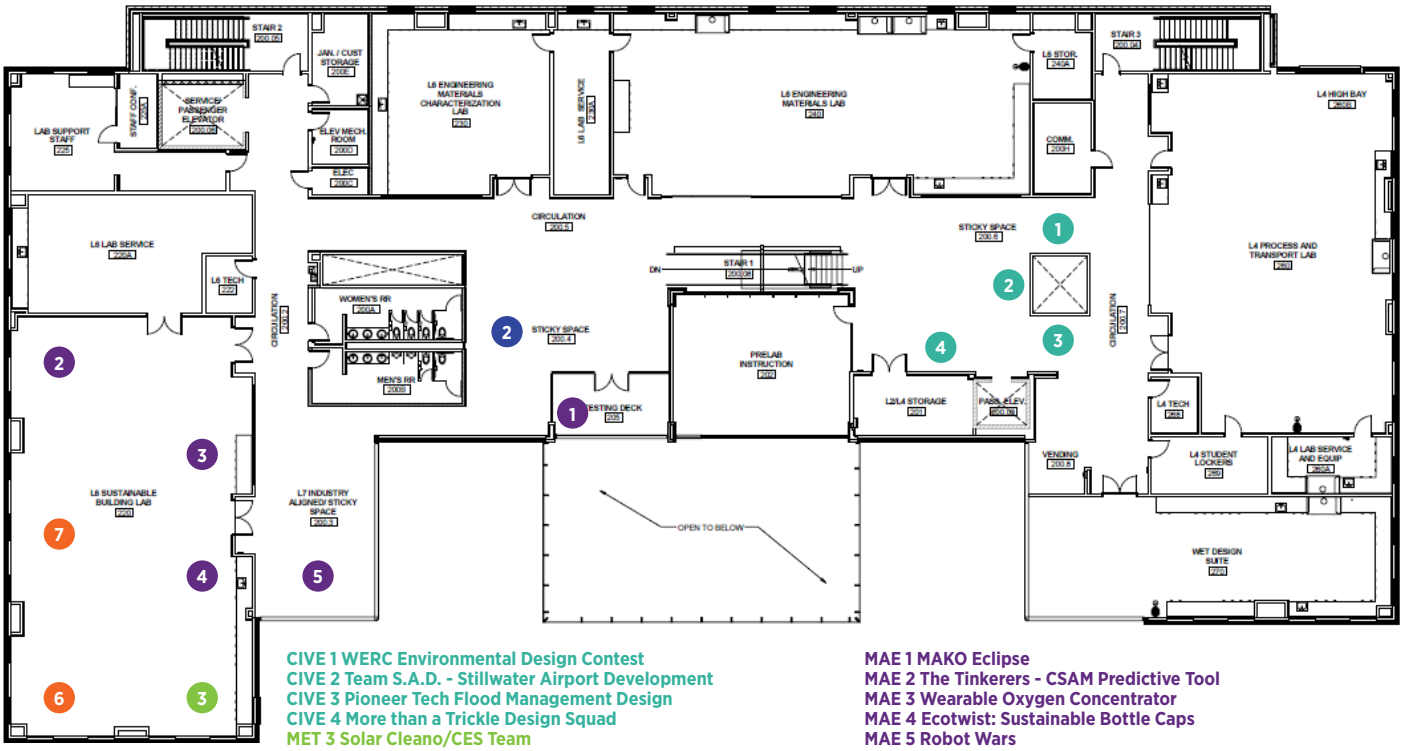
1st Floor



FPSET 1 Investigating Gusset Plates in Fire
FPSET 2 America's Greatest Homecoming: Assessing Perceptions of Risk
FPSET 3 Christmas Tree Burn
FPSET 4 Safety Committee: Keys To Success
FPSET 5 SNL Code Analysis
FPSET 6 Impulse Noise Meter
MET 1 Boeing Landing Gear Design Team
MET 2 Locomotors - Soft Pneumatic Robot

Competition Car 1 Formula
Interdisciplinary 1 Tractor Beam
Interdisciplinary 2 IGVC Self Drive Team Joyride
Interdisciplinary 3 Autonomous Firefighting Vehicle
Interdisciplinary 4 Cyclone Cowboys
Interdisciplinary 5 Skyrail (RATO Bracket)

2nd Floor



CIVE 1 WERC Environmental Design Contest
CIVE 2 Team S.A.D. - Stillwater Airport Development
CIVE 3 Pioneer Tech Flood Management Design
CIVE 4 More than a Trickle Design Squad
MET 3 Solar Cleano/CES Team
Competition Car 2 Baja

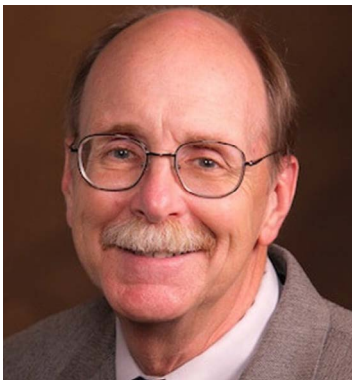
MAE 1 MAKO Eclipse
MAE 2 The Tinkerers - CSAM Predictive Tool
MAE 3 Wearable Oxygen Concentrator
MAE 4 Ecotwist: Sustainable Bottle Caps
MAE 5 Robot Wars
Interdisciplinary 6 Super Servos
Interdisciplinary 7 Project Sheath

3rd Floor

ECE 1 CubeSat Ground Station
ECE 2 Ethernet to Synchro Receiver Device
ECE 3 Random De-Random Bot
ECE 4 Cray Supercomputer
ECE 5 Not to Bragg
ECE 6 Drop-in Semiconductor Tester

IEM 1 Facility Layout Plan for Agapé Mission
IEM 2 Thermal Specialties
IEM 3 Improving Patient Satisfaction at Stillwater Pediatric Clinic
Interdisciplinary 8 Home Efficiency Solutions

A Word from the Dean



The College of Engineering, Architecture and Technology has had a monumental year filled with numerous great achievements. We re-opened the doors to the historical Engineering South in September, received a record number of grant dollars, and continued to educate the best and brightest students. Today's showcase will give you a glimpse of the outcomes of all the challenging work our students put in during their time at OSU as they highlight their senior capstone projects.

After a multimillion-dollar renovation to Engineering South, we added new classroom and office spaces, as well as modern utilities and technology. Engineering South is the new home to the Schools of Electrical and Computer Engineering and Mechanical and Aerospace Engineering. It also houses the new Zink Center for Competitive Innovation, a collaborative space for our faculty, alumni, industry sponsors and technical staff to mentor and engage with our student design and competition teams.

In addition to the Engineering South renovation there is exciting news on the research front. The U.S. Secretary of Energy Jennifer M. Granholm and Second Gentleman Douglas Emhoff visited OSU to announce creation of the Great Plains Center of Excellence, which included a $7 million funding award. OSU and Tinker Air Force Base signed a cooperative research and development agreement that will develop technology that directly impacts the readiness of the United States Air Force. We have a team of researchers and students working with the NASA Jet Propulsion Laboratory and Sandia to fly high-altitude balloons aiding in Venus exploration. Our faculty and students continue to make great advancements in the fields of engineering, architecture and technology.

We will award 224 degrees this semester. As we continue to grow our college and enhance our facilities, we will only see this number continue to grow. Our engineers leave OSU with the ability to lead companies, tackle complicated projects, and be valuable contributors in their discipline.

We could not do what we do without the support of OSU's administration and the OSU Oklahoma State Regents for Higher Education, and help from our many corporate partners, donors, and the leadership teams within CEAT.

I hope you enjoy our Senior Design Showcase and getting to know our students. The future is BRIGHT ORANGE with these seniors entering the workforce where they will solve grand challenges in all their industries.

Go Pokes!

John Veenstra
Interim Dean
College of Engineering,
Architecture and Technology

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PROJECT: More Than a Trickle Design Squad (CIVE)
ADVISOR/S: Dr. Gregory Wilber, Dr. Norb Delatte

(Left to Right) Roshan Mohan, Kal Smith, Hattie Hughs, Jasmine Martin

The Rural Water District #3, stationed out of Antlers, Oklahoma, is suffering a 48% loss and major pressure loss in their water distribution system. Our client, Trina Low, asked us to redesign the water system so that end users have more than a trickle of water at any point in the day. The goal behind our design is to decrease water loss and increase pressure throughout the distribution system by redesigning the main 10" line and installing standpipes and lift pumps.

Sponsored by:

Trina Low - Head of the Water Board for Pushmataha County

PROJECT: Team S.A.D. - Stillwater Airport Development (CIVE)
ADVISOR/S: Dr. Norb Delatte, Dr. Gregory Wilber

(Left to Right) Victoria Turner, Ray Chartouni, Josh Fairbanks, Payton Leonard

The City of Stillwater is looking to develop the west side of Stillwater Regional Airport (SWO). Development could result in major opportunity for economic development as Oklahoma's aeronautics industry continues to grow. The FAA has determined a site for the new Air Traffic Control Tower (ATCT) along the west side of the main runway. With these guidelines, our team conducted a full site design on the new industrial/aeronautic side to the west of the SWO. We designed the route of the access road to the new ATCT and required intersections after conducting a cost estimation of alternative routes. This design also included proposed building locations, as well as utility routes to connect existing utilities to the newly developed land. Team S.A.D. worked on this project because it is required to graduate and was assigned to them! Moreover, all the team members found working on an aviation-oriented project would be both challenging and engaging, allowing for a unique project experience.

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Stillwater OKLAHOMA

SWO Stillwater REGIONAL AIRPORT

PROJECT: Pioneer Tech Flood Management Design (CIVE)
ADVISOR/S: Dr. Norb Delatte, Dr. Gregory Wilber

(Left to Right) Matthew Rodriguez, Jessica Toney, Stephanie Castro, Tori Finnigan

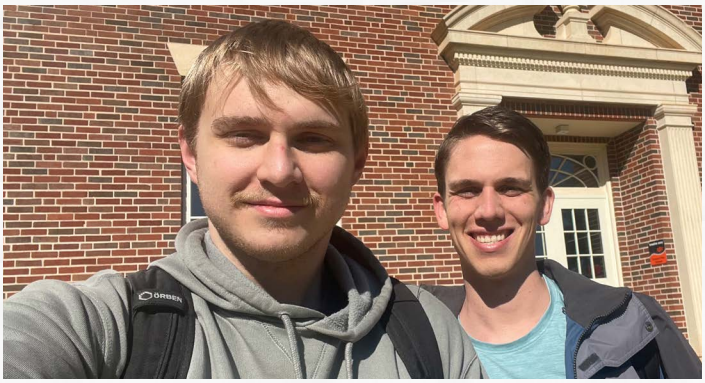
Pioneer Tech in Ponca City, Oklahoma, wants to expand their facilities. Their property is in the FEMA floodplain, making the need for specific infrastrucuture to be put in place. Our team will determine what types of infrastructure needs to be added and design it to minimize the impacts of flooding in the area.

PROJECT: WERC Environmental Design Contest (CIVE)
ADVISOR/S: Dr. Norb Delatte, Dr. Jamie Schussler, Dr. Gregory Wilber

(Left to Right) Seth Prizznick, Caden McCormick, Jeffy John

The WERC Environmental Design Contest is a contest hosted by the University of New Mexico in association with the EPA, NASA, and NASA EPSCoR. The design contest is focused on implementing low-cost high-impact solutions to areas that have historically faced climate and environmental injustices and providing relief for these areas. Focus for the design is directed towards areas that have historical and community significance. The contest focuses on mitigation of the effects of severe weather on the area chosen by each competing group with the site chosen being the Washington School District in Stillwater, Oklahoma. The proposed design solution includes implementation of green infrastructure as a way to slow down the flow of water into the surrounding channels and area while also working towards sustainable solutions.

PROJECT: Cray Supercomputer (ECE)
ADVISOR/S: Prof. Nate Lannan



(Left to Right) Patrick Laverty, Paul Megna

The Cray supercomputer has been in OSU's possession since 2018. The original design was built in 2017, and now in 2023 it's time to test what works. If the Cray is able to boot up and be used, we can virtualize it and allow specific ECEN classes to run programs or tests on it. The secondary task is to do the same idea with the Dell servers. This involves a lot of real-world problem solving, getting involved with different companies for products, and troubleshooting issues with 208V equipment. It's also good to know what still works after all the time it has been idle. The goal is to test how capable the Cray is compared to the Dell servers.

PROJECT: CubeSat Ground Station (ECE)
ADVISOR/S: Dr. John O'Hara

(Left to Right) Micah McCombs, Braxtyn Ackley, Eli Halcomb, Max Wilkins

The CubeSat Ground Station is a part of the larger CubeSat initiative at Oklahoma State. The goal is to build and test a ground station that facilitates communication with the university's satellite. The system will be able to track any spacecraft as it flies overhead with the goal of receiving information from it. For this semester, existing orbiting satellites will be tracked and listened to test the systems capability at different ranges and broadcast powers.

PROJECT: Drop-In Semiconductor Tester (ECE)
ADVISOR/S: Dr. James Stine

(Left to Right) Coleman Curtsinger, Zach Johnson, Matthew Otto

The goal of the drop-in semiconductor tester senior design group is to create a comprehensive integrated circuit testing module using system verilog and publishing this module on open source platforms such as Github. The purpose of this tester is to allow components of integrated circuits to be tested individually rather than the user having to troubleshoot simply based on the circuits singular input and output.

PROJECT: Ethernet to Synchro Receiver Device (ECE)
ADVISOR/S: Dr. Qi Cheng, Prof. Nate Lannan


(Left to Right) Landon Thorton, Huseen Buhamad, Jaden Patel, Matthew Taylor

Synchro devices are used in aviation extensively due to their reliability under the harsh conditions present during flight. Due to this, CymSTAR must interface with them in their flight simulations. This poses a challenge, however, as most commercial interfaces available are expensive and can be prone to bugs. They may also have unwanted proprietary restrictions. CymSTAR has tasked us with designing a hardware and software device that will act as a synchro receiver. The device will accurately measure the angle of the transmitter and display it to the user. The goals for our device are to generate the excitations signal necessary for the transmitter rotor, calculate the position of the rotor based on the stator voltages, and then transmit that information to the Host-PC via ethernet.

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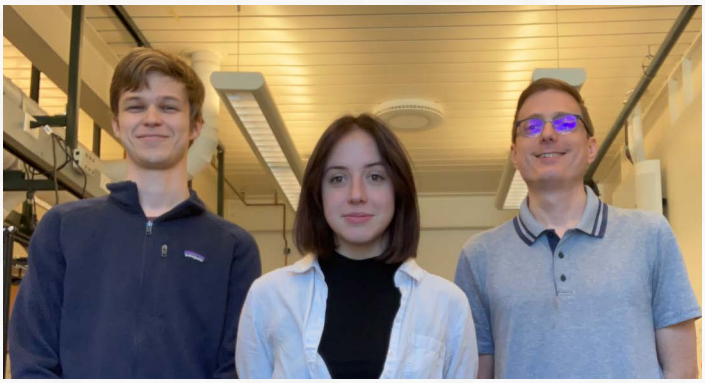
CymSTAR

PROJECT: Not To Bragg (ECE)
ADVISOR/S: Dr. Scott Mattison



(Left to Right) Campbell Woxell, Carly Gotcher, Paul Hodgen

This project aims to construct a mobile device that can be used to etch custom Fiber Bragg Gratings into single-mode optical fibers. The project will produce a device for Dr. Mattison's optics lab that can be safely placed in front of a high-power laser and have software control to specify the desired grating wavelength, order, and total length. The device and software will be easily upgradable, so modifications can be made in the future to add additional functionality down the road. This semester the team will construct the software and motion control for the project to hold an optical fiber and follow an etching pattern, along with designing laser focusing and attenuation schemes, though these schemes will not be implemented this semester.

PROJECT: Random De-Random Bot (ECE)
ADVISOR/S: Dr. Daqing Piao

(Left to Right) Ali Alqudaihi, Faisal Alzahrani, Jayden Snapp

The Random De-Random Bot is a game set of two random number generators useful for testing the effects a human consciousness may have on highly sensitive and random electrical systems. The game tracks any deviations of the random number generator from randomness. This project uses randomly generated numbers to make a set of coordinates of a cursor on the screen, in real-time, that will be displayed over a fixed duration of time on a rolling graph. The player will choose an area of the graph to mark where they intend to have the randomly generated coordinates appear the most. After the player chooses their area of "intent," the system will start plotting the numbers generated by the RNG. If the player manages to make the RNG deviate from randomness, they will be considered a winner (even if they did not manage to make the coordinates appear in their chosen area). The data from each game (with the player's consent) will be stored on a USB or SD card for future research on the effects a human mind may have on electronic devices. The game set may be operated by one or two people.

PROJECT: Americas Greatest Homecoming: Assessing Perceptions of Risk (FPSET)
ADVISOR/S: Dr. Leslie Stockel, Prof. Tim Wilson

(Left to Right) Alexis Garza, Neal Chapa, Kendra Cadena

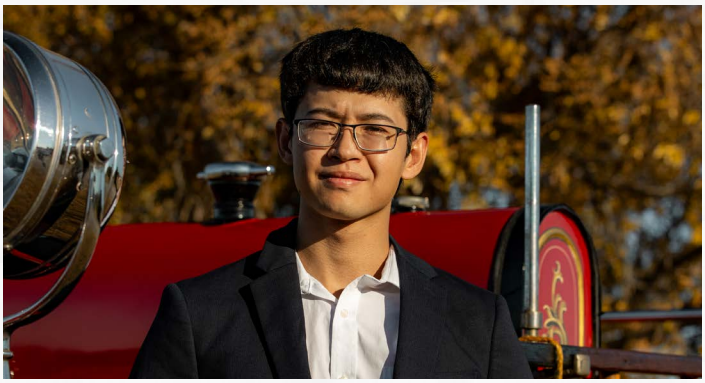
In the past, there were efforts to examine and enhance the safety practices associated with the Homecoming House Decoration process to ensure the well-being of OSU Greek life students. Despite these efforts, safety issues continued to be a concern on the construction sites. As a response, the focus shifted towards evaluating the students' perception of risk and their understanding of safety hazards and accident reporting. To evaluate this, surveys and tests were administered to gauge the Greek life students' perception of risk and assess their knowledge of safety hazards. The evaluations were conducted both before and after the house-dec construction process in order to examine a difference in their knowledge over time. The goal was to use these findings to assess the effectiveness of prior safety measures and identify areas that needed improvement to enhance student protection. This research aimed to provide insights on how students view safety within the House Decoration process and to provide valuable insights for developing more robust safety measures.

PROJECT: Christmas Tree Burn (FPSET)
ADVISOR/S: Dr. Robert Agnew, Dr. Haejun Park

(Left to Right) Yousuf Altamimi, Dallas Smith, Tyler Cordischi

This study examined how the flammability of artificial, wet, and dry Christmas trees caught fire and how much heat they released when they caught on fire. The key research question is whether there is a difference in the flammability of real and artificial Christmas trees, which tree emits more heat and is more sensitive to ignition, and which is safer. The study used the NIST's (National Institute of Standards and Technology) methodology, checking each real tree's moisture content over five weeks. After that, the trees were burned using a variety of igniting sources, such as candles, lightbulbs, and propane torches. This information can help people make informed choices about which type of tree to purchase and how to safely decorate it.

PROJECT: Impulse Noise Meter (FPSET)
ADVISOR/S: Dr. Robert Agnew



Donald Robichaux

Impulse noise is one of the leading causes of injuries in the armed forces. Due to complexities of measuring impulse noise, there is no off the shelf way to measure it. This project goes over the design and testing of an impulse noise meter, and how sampling rate affects results.

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Simplex Professorship

PROJECT: Investigating Gusset Plates in Fire (FPSET)
ADVISOR/S: Dr. Haejun Park

(Left to Right) Enrique Morales, Caleb Leibee, Sulaiman Alshammari

The purpose of the study is to provide an overview of gusset plate's performance and their potential role in the failure of lightweight wood construction during fires. The study looks to find how heat affects gusset plates and the potential risks they pose to firefighters due to their possible failure in fire conditions. Previous studies have investigated the behavior of gusset plates under heat sources to determine whether they transfer heat to wood members. These studies fail to look at gusset plates' heat transfer effects at a deeper level to understand the way the plate conducts and transfers heat under different circumstances. To better understand this problem, the heat transfer of gusset plates was investigated under a radiant heat source. Variables such as soot accumulation, teeth heat transfer effects, and the plates' ability to reflect heat were investigated. The study discovers a key correlation between soot and gusset plates' ability to conduct and transfer heat. Ultimately, the study raises concerns about the safety of firefighters and occupants in lightweight wood construction and emphasizes the need for further research to better understand the potential risks associated with gusset plates in fire conditions.

PROJECT: Safety Committee: Keys to Success (FPSET)
ADVISOR/S: Dr. Bryan Hoskins, Dr. Haley Murphy, Dr. Leslie Stockel, Prof. Tim Wilson, Soumodip Pal

(Left to Right) Casey Brock, Matthew Daniel

Implementing a safety committee is thought to be necessary for many organizations, but just having one isn't enough; it must also be effective. This project studies what characteristics constitute effective safety committees. Current literature is scattered with empirical findings describing effective characteristics, but none comprise a comprehensive best practice list, and a definite measurability method has not been found. Based on a literature review of effective safety committees and general team formation, eight characteristics commonly attributed to effective committees were tested against four different outcomes of successful teams/committees. This list was used to develop a survey and presented to those with experience in safety committees yielding 93 responses. The respondents rated the presence of the eight characteristics within their own committee and then rated the effectiveness of their committee. Ordinal logistic regression determined that the most effective committees had a stronger emphasis on defining a clear role and scope for the committee, improving the organizations perception of safety culture, and empowering the committee to influence change within the organization. Those committees also had a stronger commitment from leadership and included members from multiple areas of the organization. These results helped the researchers compile a list of characteristics that will aid safety professionals in forming a more effective and sustainable safety committee and provide a guide to evaluate the effectiveness of that committee.

PROJECT: SNL Code Analysis (FPSET)
ADVISOR/S: Dr. Robert Agnew, Dr. Virginia Charter

(Left to Right) Nicholas Fletcher, Will Hofstede, Brady Hook, Hayden Moser

When designing a new nuclear facility, conflicting codes and standards cause conflicts in interpretation that cause costly time delays. Therefore, a process is necessary to adjudicate these conflicting codes and standards.

Sponsored by:

Sandia National Laboratories

PROJECT: Facility Layout Plan for Agapé Mission (IEM)
ADVISOR/S: Dr. Sri Ramesh, Mark Lewis

(Left to Right) Abdullah Alzaqah, Kayla Higler, Logan Davis

Agapé Mission is a non-profit organization located in Bartlesville, Oklahoma. They have two programs: Food-For-Kids that serves 600 students in Washington County and an onsite program that serves between 150 to 250 meals during a work week. Their warehouse is split into two sections to hold each programs' inventory.
The senior design team will assess the current facility layout and operational workflows; offering solutions to improve cube and floorspace utilization; prioritizing user accessibility, safety, and throughput.

PROJECT: Improving Patient Satisfaction at Stillwater Pediatric Clinic (IEM)
ADVISOR/S: Dr. Katie Jurewicz

(Left to Right) Ali Almulla, Judy Nguyenvo, Andrew Caraway

The Clinic Manager (CM) is concerned due to the volume of patient complaints. Specifically, complaints about difficulty communicating with the office - hard to reach anyone via phone, not getting return phone calls after leaving a message, information about delays, etc. The CM has set expectations for certain staff positions, which include communication with patients. Therefore, the CM is concerned that the staff is unable to deliver an acceptable level of patient service that is expected with current staffing levels. The senior design team will analyze staffing levels, business processes, information flow, and job responsibilities of clinic members to recommend areas for improving patient satisfaction.

PROJECT: Thermal Specialties (IEM)
ADVISOR/S: Dr. Lizhi Wang, Steve Keister

(Left to Right) Charles Sturm, Jacob Roach, Salwa Al-Furail

Case study approach to improve reporting/accounting of material scraps from a high variability fabrication process. Deliverables seek to alleviate our sponsor's issues in cost accounting of a certain product group of urethane pipe coverings.

Sponsored by:

THERMAL SPECIALTIES

Project Video

PROJECT: Ecotwist: Sustainable Bottle Caps (MAE - OSU Tulsa)
ADVISOR/S: Dr. Jay Hanan, Zachary Cain

(Left to Right) Chase George, Brandon Roybal, Ross Compston

Our project has two main objectives; to apply the formed cap that exists with a smooth exterior due to the forming process, and to form knurlings on the exterior of the cap which can aid in the application process and/or the ergonomic removal of the cap by a consumer. In order to satisfy both of these goals, we developed a Sprag Chuck Applicator. This functions similarly to a sprag clutch, where the exterior housing would rotate and interact with free floating sprags on the interior of the chuck. This creates a relationship between the rotational torque applied and the linear clamping force provided by the jaws. The jaw shape allows for interaction to 'bite' into the exterior of the cap allowing for the application process.

Project Video

PROJECT: MAKO Eclipse (MAE)
ADVISOR/S: Dr. Brian Elbing, Dr. Jamey Jacob, Emalee Hough, Zach Yap

(Left to Right) Nathan Seaton, Kyle Richards, William Van Dyke, Blake Hop

This project was in conjunction with the NASA Nationwide Eclipse Ballooning Project. Our team's goal was to build a balloon system that is capable of recording video footage of the entire eclipse. The ballooning system will also collect atmospheric data during the eclipse. The reason we are designing something like this is because an eclipse provides a perfect "science experiment" setting where the sun is essentially turned off. This project will help study the effect of eclipses at high altitude.

Project Video

PROJECT: The Tinkerers - CSAM Predictive Tool (MAE)
ADVISOR/S: Dr. Pranjal Nautiyal, Jacob Brown

(Left to Right) Isaac Ballinger, Zack Baker, Noah Le

The purpose of this project is to design a predictive tool for the Cold Spray Additive Manufacturing (CSAM) System. As the technology is relatively young, research on the system is limited. For many aerospace and automotive industries, CSAM is used for repair and maintenance applications–altering parts dimensions, adding protective coatings for corrosion prevention, and increasing tensile strength. The tool will predict the particle impact velocity based on the parameters of the selected gas and powder.

Sponsored by:

TINKER AIR FORCE BASE

Project Video

PROJECT: Wearable Oxygen Concentrator (MAE - OSU Tulsa)
ADVISOR/S: Dr. Masoud Allahkarami, Dr. Jay Hanan, Ben Lemoreaux, Erick Pepek

(Left to Right) Dustin Boston, Nathan Wallace, Nic Dark

The Wearable Oxygen Concentrator Redesign Project aims to transform an existing oxygen concentrator from a traditional rectangular box design to a curved, wearable housing resembling an upside-down letter U. The project's primary objectives are to maintain or surpass the original device's performance metrics, including oxygen concentration over 90% and a lightweight design under 7 lbs. Additional objectives include the utilization of computer aided design for 3D printing of prototyping, and upgrading from sodium to lithium based zeolite.

Sponsored by:

ISPS

PROJECT: Boeing Landing Gear Design Team (MET)
ADVISOR/S: Dr. Lingfeng Tao, Matthew Guy, Zachary Kellas

(Left to Right) Carly Bloom, Jordan Buhler, Caleb Tuley, David Cannan

The engineering team at Boeing tasked us with a project about their 747-200 aircraft series. The aircraft has a spare set of landing gear that stays in storage between two and four years. The shock struts on the landing gear needs to be cycled every six months to lubricate the seals to prevent a multimillion-dollar overhaul. In this project, the team will design frames for the body, wing, and nose landing gears. The purpose of the frames is to support the gears for shipping and storage, and also allow them to compress and extend the strut to lubricate the internal moving parts.

Sponsored by:

BOEING

PROJECT: Solar Cleano/CES Team (MET)
ADVISOR/S: Dr. Lingfeng Tao

(Left to Right) Garet Standridge, Cody Werner, SarahBeth Sabetti, Jordan Carter

The purpose of the project is to enhance the performance of a glider that assists an autonomous solar cleaning robot. The glider faces challenges with transferring from one solar panel to another solar panel. The Solar Cleano/CES Team is designing a track system that will go over the wheels to allow the glider to transfer from panel to panel in a smoother manner and eliminate getting stuck between the panels. The Solar Cleano/CES Team is working on this project because the team wants to help improve the clean energy industry and decrease excessive manpower in the field.

Sponsored by:

SolarCleano
developed by cleaners

Clean Energy Services

PROJECT: Locomotors - Soft Pneumatic Robot (MET)
ADVISOR/S: Dr. Aurelie Azoug, Dr. Lingfeng Tao

(Left to Right) Hayden Collins, Christian Galvan

Soft robotics is a relatively new subfield of robotics that utilizes soft materials such as silicone to create robots with unique properties and abilities. Soft robots have many advantages compared to traditional robots, such as safer human interactions and the ability to change shape to adapt to their environment. Building upon the fundamentals developed last semester, the Locomotor's new objective is to create a dual function soft robot. With the intent of sparking interest in young aspiring engineers, this new robot can be controlled via a game pad with the goal of retrieving an object from a distance.

Project Video

PROJECT: Autonomous Firefighting Vehicle (ECE, EET, MET)
ADVISOR/S: Dr. Rob Agnew, Dr. Joe Conner, Dr. Guoliang Fan, Prof. Laura Southard

(Left to Right) Alex Maier, Abdullah Alenezi, Jakub Ciechowicz, Landin Olandese, Hudson Caughlin, Yousef Alali, Alexander Colton, Justin Hudson

The Autonomous Firefighting Vehicle (AFV) has multiple objectives in order for it to meet its goals. First, the AFV must locate the fire. Second, the AFV must create a pathway to the fire, while avoiding obstacles such as buildings, and move along that pathway to the fire. The primary location for operation of the AFV is at airports. Third, the AFV must approach the fire and be a certain distance from it before dispensing its foam fire retardant. Fourth, the AFV must then safely return to the home position it started at, again avoiding all obstacles. The vehicle must do all of this autonomously. The two previous semesters designed and built the AFV but did not incorporate the autonomous features. Pete's Super Soakers are responsible for upgrading the electronic hardware so that the vehicle can be made autonomous. Also, the ground control station is being redesigned to better communicate with the AFV. Some minor mechanical improvements are being made as well.

Project Video

PROJECT: Skyrail (RATO Bracket) (MET, MAE)
ADVISOR/S: Dr. Kurt Rouser, Caleb Besmer, Michael Patman

(Left to Right) John Pence, Ty Klakulak, Trevor Lindsey, Brendan Darcy, Nathan Baber, Zane Hendricks

This project is the rocket assisted take-off (RATO) launch system redesign. The RATO launch system is split into three main subsystems: bracket, sled, and rail. Tasked with launching a 250-pound mass simulator 200 miles per hour in 3 seconds, the RATO system must be able to withstand 1000-pound thrust forces from two rocket motors. The launch system will also be able to adjust by 6 inches to target a fluctuating center of gravity of the mass simulator.

Project Video | Project Presentation

PROJECT: Cyclone Cowboys (ECE, EET, IEM, MAE, MET)
ADVISOR/S: Dr. Aaron Alexander, Dr. Jennifer Glenn, Prof. Nate Lannan, Prof. Laura Southard, Kathy Jackson

Front Row, L-R: Ethan Shupe, Nathan Torrez, Crew Shortt
Second Row, L-R: Sal Aljebly, Adrian Toquothty, Julian Seida
Third Row, L-R: Max VanAtta, Jacob Ikeda
Fourth Row, L-R: Cole Welden, Matthew Griffin, Jace Stanley
Fifth Row, L-R: Keaton White, Gage Stinson
Sixth Row: Tyson Wiens

The Cyclone Cowboys are competing against teams across the country in the national Collegiate Wind Competition sponsored by the Department of Energy. The Collegiate Wind Competition calls on teams to develop solutions to the siting, development, and outreach challenges associated with fixed-bottom offshore wind energy projects. Over the course of the school year, the Cyclone Cowboys have designed and built a prototype fixed-bottom offshore wind turbine, created offshore wind energy project development plans, collaborated with members of the wind energy industry and local media, and raised wind energy awareness in their communities.

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Project Video

PROJECT: Home Efficiency Solutions (ECE, EET, MAE, MET)
ADVISOR/S: Dr. Christian Bach, Dr. Craig Bradshaw, Dr. Hantao Cui, Dr. Jeffrey Spitler, Gabriel Parker

(Left to Right) Hayden Steuart, Christian Tvrdik, Braden Landis, Reginald Young, Jack Fling, Luke McComb, Kameron Eleftherakis, Bryce Brown, Matt Palmer, Reese Townsley

If you imagine putting all of the houses in the United States on solar power, you can imagine how many batteries each house would have to have in order to supply the power need. The amount of batteries needed would end up hurting the environment more than helping it. The goal of this project is two-fold. The first is to use water as a thermal energy storage to lessen the demand of batteries for a solar house. The second is to use this design on a mobile tiny house to draw more students in by showing off the capabilities of Oklahoma State, the College of Engineering, Architecture and Technology, and the Center for Integrated Building Systems.

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

Project Video

PROJECT: IGVC Self Drive Team Joyride (ECE, EET, MAE)
ADVISOR/S: Dr. He Bai, Dr. Rushikesh Kamalapurkar, Dr. Weihua Sheng, Diego Colón

(Left to Right) Josephine Wade, Jimmy Vich, Joey Stolfa, Tyler Martinez

The Senior Design project's goal is to compete in the annual Intelligent Ground Vehicle Competition Self-Drive challenge. This means that the project must have a working Autonomy Software Stack that is capable of dynamic navigation. The previous teams designed a fully operational Drive-By-Wire system and began work on the Autonomy Stack. The past four semesters have been focused on the Drive-By-Wire system while the Fall 2023 semester is mainly focused on software design and documentation. This semester's goal is to create a map that can be used for navigation. This involves being able to identify lanes, objects, and pedestrians to put them into a map.

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Project Video

PROJECT: Project Sheath (MAE, MET)
ADVISOR/S: Dr. Aaron Alexander, Dr. Ronald Delahoussaye, Prof. Laura Southard

(Left to Right) Christopher Idell, Andrew Wright, Jager Pifer

Our goal was to create a cover for the props of the C-130 Aircraft while they are stationed at Tinker Air Force Base. It must be able to act as a chemical mask against the B&B 9095 used during paint stripping as well as providing impact protection from any equipment that is used around the blade during this process as damage incurred on both these fronts entails massive repair costs. The design must also have a faster install time than the 6-8 hours required by Tinker's current solution while still being able to be put on by 1 to 2 ground crew. Our design is made up of separate sections made of chemically resistant and non-permeable fabric for the blades and hub of the prop that become a single sealed mask after install. The blade sections also include a foam layer underneath the fabric that offer impact protection along the leading and trailing edges as well as the flat sections of the blade.

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TINKER AIR FORCE BASE

Project Video

PROJECT: Super Servos (EET, MAE, MET)
ADVISOR/S: Dr. Aaron Alexander, Dr. Joe Conner, Dr. Ron Delahoussaye, Prof. Laura Southard, Steve Eddy

(Left to Right) Jacob Bates, Marcus Evans, Melanie Freeman-Vivanco, John Seals, Wyatt Peters, Devin Anderson, Blake Jones, Matt Cromer, Ahmad Shanawaz, Parker Merrill, Brian Pavel

The world is becoming increasingly converted from traditional mechanical devices to electro-mechanical devices that allow for less complex and expensive systems. This is also true in the aviation industry. The introduction of electro-mechanical devices into aircraft has allowed for more advanced systems such as fly-by-wire controls. Fly-by-wire allows for the pilot to control the airplane with no physical connection to the control surfaces, and the addition of computerized avionics, while also eliminating heavy cable or hydraulic systems. It uses electric signals sent over wires only. These systems were developed for large aircraft first, but the need has been identified for smaller piston aircraft. The Stillwater Super Servo team has been tasked with creating a small, cheap, and low force control servo for piston aircraft by Textron Aviation.

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Project Video

PROJECT: Tractor Beam (MAE, MET)
ADVISOR/S: Dr. Brad Rowland, Chip Palmer

(Left to Right) Hayden Davis, Walker Chavarria, Nathan Thomas, Trent Blaser, Arham Chowdhury, Trey Porter, Stanton James, Henry Montague

The goal of the Tractor Beam project is to develop a low-cost lift that will allow limited mobility farmers to access their tractor cab easily and safely. The project is geared towards consumers who still have upward mobility and are not wheelchair bound. The Tractor Beam lift will be mounted directly to the tractor to allow consumers the ability to easily enter and exit the tractor cab at their leisure. This project is being assembled for the purpose of providing assistance for the people who work hard everyday to provide food. The project team has been motivated to make something useful for farmers so that they can continue to do their jobs even when the circumstances of life make it difficult.

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PROJECT: Baja (Race Team)

Cowboy Racing is a collegiate design competition team that participates in SAE Baja. This competition by the Society of Automotive Engineers challenges students to fund, design, and build an off-road prototype race vehicle that participates in a series of dynamic and static events. The main event each year is a 4-hour long endurance race with 100 other teams on the same track. Cowboy Racing has been competing for OSU since 1995. While a majority of the team members are mechanical engineering students, the competition is suitable for all majors. This year the team will compete in Gorman, California, against teams from all over the globe.

PROJECT: Formula (Race Team)

Bullet Racing is the Formula SAE team from Oklahoma State University. Every year, this team designs and builds a formula car to compete in the SAE International Formula SAE® Series against other universities across the globe. The Formula SAE competitions challenge teams of university undergraduate and graduate students to conceive, design, fabricate, develop and compete with small, formula style vehicles. The competition requires performance demonstration of vehicles in a series of events, both off track and on track against the clock.

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