2025 Senior Design Conference Project Abstracts

(Projects listed alphabetically by discipline)

Architectural Engineering

AE1 - Design of TAMUK New Growth Center
Team Members: Aaron Garza, Ramey Stevens
Course Instructor and Faculty Mentor: Dr. Xiaoyu Liu

Our senior design project is the new Growth Center at TAMUK, aimed at fixing three major problems in the northwest quadrant of the university. First, the current greenhouses and office spaces are old, cramped, and can't keep up with the growing number of students in agriculture and natural science programs. Second, pesticides from nearby crop fields are drifting into the greenhouses, harming plants and making it risky for students. Third, we want a space where all students—not just those in agriculture—can grow their own plants for fun and even grow fresh food to donate to the local food pantry. The Growth Center will be a two-story building with awesome features like a bright lobby with natural light, offices, classrooms, a lab, and greenhouses. It'll follow the latest building codes and have plenty of parking. We faced some challenges with the original design—like the upstairs greenhouses getting uneven sunlight and messing with the heating and cooling—so we're redesigning the second floor to fix that, plus adding spots for tools and plant quarantine.

AE2 - Design of TAMUK College of Nursing
Team Members: Oscar Gonzalez, Salvador Longoria Jr., Kaitlyn Luna, Jacob Martinez
Course Instructor and Faculty Mentor: Dr. Xiaoyu Liu

For our senior design project, we decided to design a College of Nursing for Texas A&M University – Kingsville. We picked this project because it's a cool way to help our school and the Kingsville area by creating jobs, bringing in new people, and giving local students a shot at healthcare careers. To get started, we did some homework: we checked out the nearby College of Pharmacy, chatted with other nursing schools, and met with university officials to figure out what they needed and how to plan ahead.

Our final design is a two-story building that's got something for everyone. The first floor is all about students—think classrooms, big lecture halls, study spots, labs, locker rooms, cold storage, and a success center for extra support. The second floor is for faculty, with quiet offices, lounges, meeting rooms, a reception area, and even a chill balcony. The building's outside looks like the rest of campus, so it blends in perfectly.

AE3 - Javelina Den
Team Members: Rachel Montgomery, Jessenia Moya, Nayeli Montemayor, Eva Delgado
Course Instructor and Faculty Mentor: Dr. Xiaoyu Liu

Our senior design project is to build the new dining hall at Texas A&M University-Kingsville, to solve the overcrowding in the current dining hall and make space for more students. Based on student feedback, we're creating a multipurpose spot with restaurants, a buffet for meal plans, study areas, conference rooms, and gaming zones, all located centrally where the health and recreational center is now for easy access. Our goals are to maximize space, offer more food options, make it flexible for different purposes, keep it comfy, and use eco-

friendly materials and systems. We'll use smart furniture and layouts, diverse food stations, and energy-saving designs to pull this off. The project includes designing the building's look and structure, setting up heating, cooling, and lighting, and managing the budget and timeline with tools like Revit and AutoCAD. The Javelina Den will make campus life better by giving everyone a welcoming place to eat, study, and hang out.

AE4 - Design of L.O.G.X. Center
Team Members: Jordan Gonzalez, Aitong Xu, Marco Ortiz, Veyda Lake
Course Instructor and Faculty Mentor: Dr. Xiaoyu Liu

Our senior design project is the L.O.G.X Center, a new three-story competition center for Texas A&M University – Kingsville. Located at West Corral Avenue and North Armstrong Street, this 105,000-square-foot building will replace the SPEC gym as the main spot for collegiate games and graduations. After it's built, the SPEC will still be used for classes and practice. The L.O.G.X Center is part of the university's 10-year plan and aims to give athletes and staff a modern, comfy space—unlike the old SPEC, which needs lots of repairs and gets complaints. We're also expanding the stadium's parking lot, starting with its 220 spaces, to fit at least 253 spots required by local rules for the building's size. This project brings teams together to design something fresh and innovative that meets everyone's needs on campus.

AE5 - Design of Buc-ee's Gas Station
Team Members: Jessie González, Isael Gonzalez, Tony Rosenbaum, Jose Pina
Course Instructor and Faculty Mentor: Dr. Xiaoyu Liu

Our senior design project is all about bringing a huge 92,000-square-foot Buc-ee's to Kingsville, Texas—the biggest in the state and the first in South Texas. We're turning an old, abandoned mall into a busy stop for travelers, giving them much-needed gas and convenience services along a crowded highway, especially during busy travel times. Our team used Revit to build a 3D model, with architects and engineers teaming up to design a store that's not just massive but also easy to use and fun to visit. We added cool features like picnic tables and roomy interiors, plus plenty of space for cars to move around safely. This Buc-ee's will create jobs, help the local economy grow, and put Kingsville on the map for travelers everywhere.

AE6 - Design of Kingsville County Fire Station
Team Members: Nahtzely Acosta, Alicia Grey, Ryan Pena, Alexa Reyes
Course Instructor and Faculty Mentor: Dr. Xiaoyu Liu

Our senior design project is a new two-story fire station for Kleberg County, designed to support seven full-time firefighters and serve the community. The architectural design features four large bays for fire trucks, offices, conference rooms, a dormitory, showers, a commercial kitchen, and a lounge area, with six storage rooms (three air-conditioned) based on feedback from the current station. Next, we'll design the parking lot and select furniture. For the mechanical systems, we've calculated preliminary loads, zoned rooms for heating and cooling with VAV boxes, and planned 12"x12" ceiling diffusers, vertical exhausts in restrooms, and ceiling exhausts in showers. A second-floor mechanical room will connect to rooftop units, and we'll update loads and ductwork with the new building design. Electrically, we've laid out Lithonia 2x4 lights, high bay and suspended lights for the bays, plus downlights and pendants elsewhere, along with receptacles, a 100 kW Generac generator, two panelboards, and a

transformer. We'll refine the lighting and power layouts, find accurate light specs, finish circuiting, panel schedules, and a one-line diagram.

Chemical Engineering

CH1 - Vinyl Chloride Production
Team Members: Madison Flores, Maria Porter, Belicia Saldana
Course Instructor and Faculty Mentor: Dr. Matthew Alexander

This project details the design and simulation of a vinyl chloride production process using ethylene and hydrogen chloride, targeting a production rate of 400,000 tons per year. The vinyl chloride monomer can be further reacted to create polyvinyl chloride, a widely used plastic. Our process encounters three main reactions of direct chlorination, oxychlorination, and pyrolysis. The first two reactions of direct chlorination and oxychlorination are parallel reactions in which inputs are main components of ethylene with chlorine or hydrogen chloride, respectively, to create a product of ethylene dichloride. Direct chlorination takes place through a continuous stirred tank reactor, while oxychlorination takes place through a plug flow reactor. Further, the ethylene dichloride is taken to a purification section, then processed as the input of a plug flow reactor for pyrolysis to produce vinyl chloride. We conducted a design in which the hydrogen chloride is recovered from the process and inputted to feed oxychlorination. The simulation was executed utilizing Aspen HYSYS. After completing our design, we have finalized our simulation and concluded our conversion of ethylene in direct chlorination is 93%, oxychlorination is 100%, and in pyrolysis is 59%. Thus, the overall reactions reach our target production goal.

CH2 - Renewable Ethanol Synthesis from Corn
Team Members: Justin Cappadona, Haniya Farhat, Ryan Taylor, Gladys Ngamai
Course Instructor and Faculty Mentor: Dr. Matthew Alexander

This senior design project focuses on designing an efficient and sustainable ethanol production process from corn using ASPEN Plus for process simulation and optimization. The system includes milling, saccharification, fermentation, distillation, and dehydration. A total production rate (TPR) of 200 million gallons per year of ethanol is set as the target, guiding process optimization to maximize ethanol yield and purity. Key parameters such as reflux ratio, number of stages, and tray configurations are adjusted to improve separation efficiency. To enhance dehydration, azeotropic distillation with benzene is used to break the ethanol-water azeotrope, ensuring high-purity ethanol recovery. Heat integration strategies reduce energy consumption, and waste heat recovery minimizes operational costs. Additional enhancements include optimizing fermentation conditions for better conversion and considering byproduct utilization for improved process economics. The final design ensures economic feasibility, regulatory compliance, and environmental sustainability while efficiently meeting production targets.

CH3 - Bioethanol from Corn Stover
Team Members: Shelby Battles, Maricela Cuevas, Marissa Fletcher
Course Instructor and Faculty Mentor: Dr. Matthew Alexander

Our team's objective is to ensure the sustainability of the production of bioethanol from cellulosic feedstock, targeting a production rate of 300,000 metric tonnes of ethanol per year. This will contribute to a more renewable energy solution to utilize agricultural waste, promote environmental sustainability, and provide an alternative to fossil fuels. Our process will begin with an ammonia fiber expansion (AFEX) pretreatment to enhance the digestibility of the lignocellulosic material. Then the process will proceed through enzymatic hydrolysis, breaking down the cellulose and hemicellulose into glucose, then proceeding through fermentation using the chosen yeast *Saccharomyces cerevisiae*. Then the ethanol mix will go through a distillation to separate the crude ethanol from water. Since ethanol and water are azeotropic, ethanol will go through a molecular sieve to dehydrate the water to make pure ethanol. The outcome of this project is to have an efficient, cost-effective, and environmentally friendly ethanol production system.

CH4 - Liquified Natural Gas Plant Design
Team Members: Kayla Brulloths, Emmanuel Ramirez, Merari Castillo, Alexis Villalobos
Course Instructor and Faculty Mentor: Dr. Matthew Alexander

The capstone project focuses on designing a mid-scale liquefied natural gas (LNG) facility in Ingleside, Texas. The goal is to produce 1.5 million tons per annum (MTPA) of LNG from 260 million standard cubic feet per day (MMSCFD) of pipeline gas for export to other countries. The plant will operate for 11 out of 12 months to account for scheduled maintenance. ProMax was utilized to simulate the sweetening, dehydration, and liquefaction of natural gas. The removal of carbon dioxide and hydrogen sulfide (sweetening) is performed using a 30:70 solution of diethanolamine (DEA) and water. The dehydration process uses triethylene glycol (TEG) to remove the bulk amount of water, followed by a molecular sieve to bring the gas into specification and prevent hydrate formation during liquefaction. The treated gas is sent to liquefaction, where it is cooled using a cascade refrigeration cycle that utilizes propane, ethane, and methane. A liquid knock-out is used early in the liquefaction process to separate heavier components, which are sent to fractionation. Depending on market conditions, the plant will operate in ethane recovery or rejection mode; ethane recovery mode extracts ethane for plant use or sale as a petrochemical feedstock, while ethane rejection mode leaves the ethane in the residue gas to be used as fuel or reincorporated into the LNG feed stream.

Civil Engineering

CE1 - Porky's Arcade
Team Members: Christopher Gonzales, Roger Hagan, David Pena, Jesus Soto, Kevin Zeidan
Course Instructor: Dr. Breanna Bailey

Porky's Arcade is a proposed high-tech recreational facility designed for Texas A&M University-Kingsville students as well as the Kingsville community. The primary objective of the project is to establish a modern, inviting space where students can engage in recreational

gaming, relax, and pursue academic activities comfortably within the campus environment. The arcade will provide access to advanced computing hardware, offering a wide variety of gaming options suitable for diverse interests. Additionally, the facility will include spacious lounge areas intended to promote both leisure and productive study sessions.

The building design encompasses two stories supported by a steel structural framework, ensuring durability, safety, and long-term usability. A mat foundation will be implemented beneath the structure to enhance stability while minimizing the impact on existing campus infrastructure and landscape. Outdoor seating areas will also be integrated into the facility's design, creating opportunities for relaxation, socialization, and casual gatherings in a comfortable setting.

Upon completion, Porky's Arcade is anticipated to significantly enrich student life by providing a central hub for social engagement, leisure, and collaboration. The facility aims to foster an inclusive environment that not only meets recreational needs but also supports academic success and community development within the university.

CE2 - Javelina Corral
Team Members: Musallam Alazemi, Luis Jaime, Juan Marines, Ray Saenz
Course Instructor: Dr. Breanna Bailey

Our project consists of a three-floor parking garage with a green roof. The first three levels will be for parking spaces that are needed since there is a lack of parking on campus due to increasing student enrollment. The top level will be reserved for the green roof which will serve as a community hub where the people can relax and enjoy the campus view.

We utilized structural analysis to determine our loads using the ASCE 7-22 code and applied pressure loads into our structural model and designed according to IBC and ACI codes. The structure is completely made of reinforced concrete. The hydrology design was determined with surveying points taken and using Kingsville municipal codes and the rational method. Our foundation design was determined according to our axial column load and our wind load demands as well as our soil classification to determine parameters needed. The project will have a cost estimation of materials to be used and a schedule to determine the time of the project. We expect the structure to ensure safety and comfortability to the community.

CE3 - Pillar Point
Team Members: Hamad S. Alazemi, Sandra Barrera, Jerika Hernandez, Mohammad Kamal, Sebastian Velazquez, Alessia Willie
Course Instructor: Dr. Breanna Bailey

As Texas A&M University-Kingsville (TAMUK) strives to expand its student enrollment to 10,000 by 2028, the demand for on-campus housing continues to grow. Our senior design project focuses on addressing this need through the design of Pillar Point, a modern, three-story dormitory that enhances student living while fostering a strong campus community. The dormitory will feature suite-style rooms, with each suite accommodating four students of the same gender and including a shared restroom. The first floor will house two lobbies with essential amenities such as a convenience store, lounge area, mailroom, administrative offices, and a coffee shop. Additional student resources include laundry facilities, study rooms, and meeting rooms on each floor. Outdoor amenities such as a dog park, grilling areas, a greenhouse, and third-floor balcony lounges will further enrich student life.

By incorporating these elements, Pillar Point provides a sustainable and functional solution to TAMUK's housing shortage. With current dormitories reaching maximum capacity, many students are being housed in off-campus apartments, reducing their engagement in campus life. Pillar Point will offer a "home away from home" experience, ensuring that students have convenient access to academic resources, social opportunities, and essential services. This project aligns with TAMUK's 2025-2027 strategic plan by directly supporting enrollment growth and enhancing student retention through improved residential experiences.

CE4 - Cattleman's Catch
Team Members: Ricardo Barbosa, Payton Chapman, Rodolfo Gallegos, Devyn Hampton, and Maggie Spiekerman
Course Instructor: Dr. Breanna Bailey

The Cattleman's Catch project involves the design and construction of a two-story, rustic-themed restaurant located in Riviera, Texas. The project aims to provide a unique dining experience that reflects the region's rich agricultural heritage while offering modern amenities and structural integrity. The first floor will include dining spaces, a full-service bar, and kitchen facilities, while the second floor will feature additional seating areas and scenic views of the surrounding landscape. The design will prioritize sustainability, with energy-efficient systems, stormwater management solutions, and durable construction methods tailored to the coastal environment. The project will ensure compliance with local building codes, environmental standards, and safety regulations, creating a welcoming and functional space for the Riviera community and visitors alike. The engineering components highlighted in this project are structural design, foundation design, hydrological design, and a small portion of transportation for the designing of the parking lot. The end result of the project will present a beautiful restaurant structurally sound for the windy coastline with a deep pier foundation and a functional easy to maintain parking lot for both the restaurant and the existing Riviera Beach Pie

Computer Science

CS1 - The Pet Place
Team Members: Kekoa Madeira, Sean Crosby, Robyn Barrera
Course Instructor and Faculty Mentor: Dr. David Hicks

"The Pet Place" will allow pet owners to gain important information on their pet and how to take care of them. The website will have four sections that will help the user in raising and helping their pet. The "Vet/Park" button will show nearby parks and vets and their location. The location finder will allow pet owners to take their pet to nearby parks that they can take their pet to, allowing that animal more space to exercise and interact with other pets. It will also show nearby vets if the user is concerned about possible health concerns or if the pet gets injured. The "Bonding" button will allow information on how to bond with the pet, based on their species. This section will help the pet owner if they have gotten a new pet or if they have had trouble getting their pet to trust them. The "Feeding" button will help a pet owner know the proper amount of food to feed their pet. The user can put in the pets recommended size and how much the actual pet weighs, and the user will be given info on the proper amount of food, based on whether they are a healthy weight or if they are under/overweight. The final section is the "Find Your Pet" button. This section will allow the user to gain general information on the pet based on

the species and breed. It will give information on how well they get along with other animals and people, how active they are, and common health issues the breed faces.

CS2 - FPGA-Accelerated Phishing Detection
Team Members: Henry Crawley, Anthony Odvina, Jonathan Martinez, Jessie Contreras
Course Instructor and Faculty Mentor: Dr. David Hicks

An estimated 3.4 billion phishing incidents occurred daily in 2024. Specifically, among university students, researchers have found that approximately 90% of students have opened at least one of three phishing emails, and around half of the students pressed one that included a link. For this reason, this research presents a novel approach to combating the growing threat of phishing attacks.

This paper proposes an FPGA-accelerated phishing detection system that leverages machine learning techniques to achieve real-time detection capabilities while optimizing resource utilization and energy efficiency. The system employs Field-Programmable Gate Arrays (FPGAs) as a co-processor to handle computationally intensive tasks such as feature extraction and lightweight classification models, with the FPGA working in parallel with existing CPU infrastructure. Our methodology includes the development of specialized hardware-software integration, selection and optimization of machine learning algorithms for FPGA deployment, and creation of a user-friendly interface for timely threat notifications.
The project will utilize a dataset of at least 2000 phishing attack emails obtained from Texas A&M University-Kingsville's IT department, with features extracted from URLs, domain characteristics, and email content. Performance evaluation will be conducted using comprehensive metrics including True Positive Rate, Precision, F1 Score, and inference latency.

Our research contributes to the cybersecurity field by demonstrating how specialized hardware acceleration can enhance phishing detection systems. FPGA acceleration could potentially offer significant improvements in processing speed, detection accuracy, and power efficiency compared to traditional CPU-only solutions, while providing a scalable framework adaptable to evolving phishing tactics.

CS3 - Automotive Crash Detection App
Team Members: Zackary Delagarza, Luis Figueroa, Nathan Gamez, Jason Randolph, and Alexis Santiago
Course Instructor and Faculty Mentor: Dr. David Hicks

Our team is developing an android app for automotive crash detection because there are several challenges our team wants to improve upon. Our app aims to address these challenges by improving accuracy, reducing costs, and offering universal accessibility, distinguishing it from other competitors. Specifically, our app will detect impacts, collisions, sudden pressure changes, and anything else that suggests a crash, in the hope of detecting one in the event where the person in the car can’t make a phone call themselves. So, our app will call emergency services for the person so they can arrive faster. Our group will achieve this by having our own map, database, and through testing our product with a small remote-controlled car. Our team is using Android Studio for our Integrated Development Environment (IDE) and Firebase for the database.

CS4 - Squadron - A Social Media for Texas A&M - Kingsville
Team Members: Devon Flores, Jack Crockett, Max Clarke, Marcus Perez
Course Instructor and Faculty Mentor: Dr. David Hicks

The increasing reliance on social media has transformed how students communicate, collaborate, and engage with academic and extracurricular activities. Squadron aims to develop a dedicated social media platform specifically for college students to enhance student networking, academic collaboration, and campus involvement. The platform will incorporate features such as profile creation, a home feed, study group organization, private messaging, and an exclusive marketplace for students to buy and sell textbooks and other essential university supplies, such as notebooks, calculators, and software tools. Unlike mainstream social media, which prioritizes entertainment and broad connections, Squadron will focus specifically on fostering meaningful academic and professional relationships within the college community.

This site will have customizable privacy settings, and to ensure that the platform remains exclusive to the student body, registration will require a verified university email to prevent misinformation and inappropriate content.

The platform will be developed using HTML, CSS, PHP, and MySQL ensuring a responsive, scalable, and user-friendly experience. Squadron aims to bridge gaps in student networking, providing tools for academic success, career development, and essential campus engagement. By supporting student interaction in both academic and extracurricular areas, Squadron will enhance the overall college experience and foster lasting connections that benefit students throughout their university journey and beyond.

CS5 - Captured Garden
Team Members: Rogelio Ramos, Jonathan Marfell, Jonathan Serna, Wesley Thompson
Course Instructor and Faculty Mentor: Dr. David Hicks

Captured Garden is a gamified learning application designed to reconnect individuals with nature by encouraging outdoor exploration and environmental education. In today's technology-driven society, many people are disconnected from the natural world, leading to a lack of understanding about local ecosystems and plant species. Captured Garden addresses this issue by combining image recognition and GPS technology to create an engaging and educational experience. Users can scan plants using their device's camera, identify species through Google Cloud Vision, and receive detailed information about their properties, ecological roles, and potential dangers.

The app enhances motivation through a point-based reward system, where users earn points for identifying rare species and completing daily challenges. A personalized digital garden allows users to visualize and organize their collected plants, while leaderboards and social sharing features promote community interaction and friendly competition. Geo-tagging and geofencing enable users to explore different biomes and discover region-specific plant species, fostering a deeper understanding of local biodiversity.

Captured Garden's design strategy prioritizes scalability, reliability, and user engagement. Data is securely stored in a Google Firebase database, ensuring efficient handling of user profiles, plant data, and location logs. The app is developed for Android using Android Studio, ensuring broad accessibility and a seamless user experience. By merging environmental education with gamification, Captured Garden motivates users to explore nature, improve their knowledge of plant species, and engage with others in a socially connected learning

environment. This project aims to inspire a lasting appreciation for nature while promoting environmental awareness and personal well-being.

CS6 - Bioware
Team Members: Angie Molina, Martin Valadez, Jared Keller, Nicholas Morales, Daniella Avila
Course Instructor and Faculty Mentor: Dr. David Hicks

Bioware is an integrated software solution designed to revolutionize data management for biology lab technicians and data collectors by consolidating data recording, inventory management, and database storage into a unified platform. Its intuitive interface allows users to efficiently log, organize, and retrieve research data while minimizing human error and improving accuracy. One of Bioware's standout features is its real-time inventory tracking system, ensuring that laboratory supplies are properly monitored, reducing disruptions caused by stock shortages or expired materials.

The software enhances collaboration by enabling multiple users to work simultaneously on shared data, ensuring that updates are immediately reflected across the system. Security and compliance are prioritized, with robust access controls and audit logs to protect sensitive information, making Bioware suitable for academic and industrial laboratories.

Bioware is scalable, adaptable to both small and large labs, and offers potential for future expansion across different scientific disciplines. Its modular design enables the seamless introduction of new features, including _satellite connectivity for remote access, and cloud computing for cross-platform compatibility.

Initially developed to address inefficiencies in the biology department at Texas A&M University-Kingsville, Bioware is designed to have a broader impact by improving data management standards across research institutions globally. By streamlining workflows and enhancing data accuracy, Bioware empowers researchers to focus on advancing scientific discoveries. With its potential to scale and adapt to diverse fields, Bioware promises to be a transformative tool in the world of scientific research and data management.

CS7 - Step Saga
Team Members: Kaitlynn Gonzalez, Miles Boyd, Jamilee Juarez
Course Instructor and Faculty Mentor: Dr. David Hicks

The Step Saga application is mainly focusing on developing a motivating video game for the phone, that is designed to promote physical activity by tracking the steps of the user. The game is used to encourage walking and running as part of a healthy lifestyle. Some key components of the application include a step tracker, GPS, character designs, and creating an immersive map and background that is visually pleasing to the user’s eyes. Now working with tools like Blender and Unity to get the game to function in the way it is needed, the elements integrated is to ensure both visual appeal and functionality. Building upon work from the previous semester, the final stages were in the works as the coding and testing were to be integrated for the game. The goal is to deliver a compelling gaming experience that not only entertains but inspires physical fitness among its users. The importance of our project stems from the downward trend of health and fitness in our society, especially with the younger generations. Our mobile game “Step Saga” arrives as a bridge to close the gap, creating a fun and healthy way to not only engage in physical activity but be a part of a compelling Augmented Reality world. We will attempt to build off predecessors and their mistakes, such as Pokémon Go, by

attempting to insert a pedometer into the app, allowing convenient tracking and easy use of the app on the go.

CS8 - Student Housing App
Team Members: Andrew Trevino, Xavier Gonzalez, Marissa Del Bosque, Alvaro Gonzalez
Course Instructor and Faculty Mentor: Dr. David Hicks

Finding a good place to live off-campus can be stressful for university students. Our project is a mobile app designed to simplify this process by helping students quickly find available housing in their area. The goal is to save time and effort while ensuring students find a place that meets their needs.

The app will have a simple account setup for both students and landlords, making it easy to list and search for properties. Users can explore housing options through an interactive map, where they can view property details, contact landlords, and filter results by price, location, and ratings. A review system will let students share experiences, helping others make informed decisions.

For convenience, users can browse as guests, but they'll need an account to leave reviews or handle payments. The app will also require a secure server, real-time communication, and location-based features to ensure smooth operation and protect user data. Additional features like property amenities, direct messaging, and saved searches will further improve the user experience.

By making the housing search easier and more efficient, this app will help students find the right place faster while giving landlords a better way to reach potential tenants. The goal is to create a hassle-free, transparent, and user-friendly platform that benefits both students and property owners.

Electrical Engineering

EE1 - Smart Garage Control & Monitoring System
Team Members: Yousef Aldahoum, and Abdullah Alazmi
Course Instructor and Faculty Mentor: Dr. Lifford McLauchlan

The smart garage monitoring and control system aims to ease the daily garage operation while reducing some life-threatening situations. The system monitors harmful gas that can accumulate inside the garage by utilizing a sensor-warning system. To automate the lighting system inside the garage, the system utilizes a light detection sensor with an actuation system. The main feature of the garage monitoring and control system is the automatic door control by using a dual edge vehicle detector system. This feature enables the system to detect and open the garage door when a vehicle tries to enter the garage. On the other hand, it also opens the garage door by detecting the intent to exit the garage.

EE2 - The Hive
Team Members: Trevor Reyna, Anthony Anderson, Diego A. Garza, Elias Lemus
Course Instructor and Faculty Mentor: Dr. Lifford McLauchlan

The Hive aims to deliver cheap, safe, and mobile power to Airports. Considerations for this system include International Electrical Commission standards for Li-Po Battery safety as well as fail-safe circuit design. The system functions in two parts: The Hive and its Cells. The Hive is an immobile base station which serves to charge and connect the Cells to a database. The Cells

function as a portable USB battery charger safe enough for air-travel. The Cells are controlled via an ESP 32 which connects to a database when near a Hive. The Cell can be returned to a different Hive from which it was rented allowing for easy return upon landing.

EE3 - TechMet - Smart Bicycle Helmet
Team Members: Leonardo Ramos, Brian Gomez, Cristofer Lopez
Course Instructor and Faculty Mentor: Dr. Lifford McLauchlan

The primary goal of this project is to develop a helmet that increases the safety of cyclists by integrating an effective distress response mechanism. Cyclists face various potential hazards, so it is important to have an immediate alert system in case a rider experiences an accident and is disoriented. In the event of a crash, an alert will be sent to first responders if a concussion-inducing force is detected. Therefore, the purpose of this system is to ensure cyclists' safety by reducing the response time of medical help. The design is powered by an ESP32 microcontroller and uses force-resistive sensors with an accelerometer module for accident detection. An SMS message with compiled GPS data is sent to emergency contacts when a strong force is measured. Additional features such as an automated headlamp and brake lights are implemented to increase visibility at night. An extra feature is Bluetooth connectivity with a user-friendly interface to compete with similar products on the market. By automating an emergency alert, which includes the rider's location, and providing visibility enhancements, the design is aimed to reduce emergency response time and improve overall rider safety.

EE4 - CapLockt: Two-Factor Authentication Biometric Door Lock System
Team Members: Jimmy Burrows, Maielah Davis, Ava Martinez, Terri Tesch
Course Instructor and Faculty Mentor: Dr. Lifford McLauchlan

CapLockt is a two-factor authentication door lock system designed to enhance home and business security by integrating facial and phrase recognition. This system is compatible with standard deadbolt locks, allowing for easy installation without requiring a complete lock replacement. The product's design makes it a practical and cost-effective upgrade for improved access control. By leveraging mechanical, electrical, and computer science principles, CapLockt combines biometric authentication with a secure, hands-free locking mechanism. The system features a camera and microphone to capture biometric inputs, a microcontroller for processing authentication data, and an electromechanical deadbolt for secure locking. A web interface enables users to manage access credentials remotely, adding flexibility and ease of use. The multi-factor authentication (MFA) enhances protection against unauthorized access. CapLockt offers a reliable, compact, and efficient security solution that prioritizes user convenience without compromising safety. Future enhancements may include AI-driven authentication, mobile integration, and real-time security monitoring for broader applications.

Environmental Engineering

EV1 - Sustainable Coastal Flood Prevention/Reduction Solutions for Rockport, Texas
Team Members: Kalissa Lucio, Lourdes Paulina Lerma, Janay Garza, Alejandro Dimas, Alejandro Juarez
Course Instructor and Faculty Mentor: Dr. Jennifer Ren

The City of Rockport, TX, experiences recurrent downtown flooding due to the existing drainage infrastructure being insufficient to accommodate the volume of stormwater input, as

evidenced by the testimonials from local business owners. This flooding has resulted in financial losses for local businesses and structural damage to the local community. Thus, the objective of this project was to design a sustainable coastal flooding prevention and reduction system in Rockport, TX, with a focus on cost-effectiveness and aesthetic appeal. This design focused on incorporating engineered rain gardens throughout the downtown area to enhance infiltration, reduce runoff velocity, and improve the quality of water being released in Rockport waters. Additionally, the existing breakwater system will be enhanced to further mitigate flooding in the area. The rain garden system utilizes the current stormwater system to direct excess water back into ocean, therefore reducing the hydraulic load. The system acts as temporary storage for excess water while employing methods that decrease the velocity of water, therefore helping to prevent excessive flooding during peak storm conditions.

Mechanical Engineering

ME1 - Design and Analysis of a SCARA Robotic Mechanism

Team Members: John Cantu, Kassandra Plata, Gerardo Rosas, Raul Zamora, Ricardo Guevara

Course Instructor and Faculty Mentor: Mr. Grady Isensee and Dr. Hong Zhou

A S.CA.R.A. Robotic Manipulator (Selective Compliance Assembly Robot Arm) is a device commonly used in industry to perform repetitive tasks such as drilling, welding, and assembling. An attribute of the SCARA Manipulator is the jointed two-link arm layout (like the human arm). This feature allows the arm to extend into confined areas and then retract or fold up out of the way. Our project utilizes many areas of Mechanical Engineering including, but not limited to: Statics, Dynamics, Controls, Machine Design, Programming, Circuits, and Manufacturing. Key aspects of the design will include a robust kinematic analysis, a kinetic analysis, and optimization. Furthermore, a complete set of detailed drawings and specifications will be provided. Our final project will satisfy applicable robotic standards and stated objectives.

ME2 - Closed Loop Cooling System for EV Batteries

Team Members: Adam Gonzalez, Bryan Gutierrez, Nathan Loose, Lazaro Reyes, Ramiro Vera

Course Instructor and Faculty Mentor: Mr. Grady Isensee and Dr. Hong Zhou

This report presents an overview of the progress made in developing a multi-sectioned cooling system designed to function as a testing section within an assembly line for the cooling systems of large-voltage batteries. The primary objective of this system is to meet essential safety requirements and efficiency standards for companies involved in high-voltage battery production, including industry leaders such as Tesla and Exxon. By offering precise diagnostics testing, the system enhances battery performance and reliability, leading to safer energy storage solutions. The cooling system will be built to minimize material waste, cutting operational costs for manufacturers. Additionally, minimizing downtime and accelerating product development cycles will improve overall system efficiency. This focus on cost-effectiveness benefits manufacturers while also supporting the broader adoption of sustainable battery technologies.

ME3 - Design of a Dust Mitigation Device for Extraterrestrial Conditions
Team Members: Isaiah Aleman, Jeremiah Aleman, Oliver Barera, Zariela Coronado, Zavier Drennon
Course Instructor and Faculty Mentor: Mr. Grady Isensee, and Mr. Rajashekar Mogiligidda

The mission of this senior design capstone project is to create a dust mitigation device for extraterrestrial conditions. The team will compete in the 35th Annual WERC Environmental Design Contest Sponsored by NASA and the New Mexico Space Grant Consortium. Dust collection presents serious problems for astronaut safety and equipment performance on space missions, particularly in environments like the Moon and Mars. Particles of fine dust, due to their sharp and elongated particle construction caused by the absence of weather conditions, can stick to surfaces, impair the functionality of machinery, and cause moving parts to wear out more quickly. In-depth study on the behavior of Mars dust, material selection, and power-efficient mechanisms is required for this project. This is followed by SolidWorks modeling, simulation, and physical prototype. A key requirement for future human exploration of planets beyond Earth is the length and dependability of space missions, which could potentially be greatly improved by the successful implementation of this dust reduction system.

ME4 - Microturbine Exhaust Heat Reclamation System
Team Members: Hunter Collins, Nathan Francis, Hector Gonzalez, Joseph Toren
Course Instructor and Faculty Mentor: Mr. Grady Isensee and Dr. Sangsoo Lee

Gas Turbines generate extremely hot exhaust gases. Consequently, there is a large amount of wasted energy contained in these gases. The main thrust of our project is to harvest a portion of this otherwise wasted energy and use it to do productive work. A natural gas fueled "Micro-Turbine" (Electric Generator) provides the impetus for our project. A heat exchanger/boiler will be designed, analyzed, and evaluated using methods from Thermodynamics, Fluid Dynamics, and Heat Transfer. The heat exchanger/boiler will capture a portion of the energy in the hot exhaust gases and use this energy to create steam. This steam will be used to drive a steam turbine thereby doing useful work.

ME5 - Design of a Hydraulic Arm for Industrial Applications
Team Members: Benjamin Avalos, Cole Charbula, Josey Ibarra, Christopher Scott, Cody Upton
Course Instructor and Faculty Mentor: Mr. Grady Isensee and Dr. Hong Zhou

Hydraulic excavators are widely used in construction activities worldwide. Our goal is to create a compact but powerful excavator arm capable of producing large digging and break-out forces while being efficient and cost-effective. The study describes the design process, which includes an evaluation of current excavator technologies, restrictions, and performance requirements. Analyses were performed, including bucket capacity, digging forces, and static structural integrity calculations, to ensure compliance with industry standards like ISO 6015 and ISO 7451. Moreover, a SolidWorks model was created to admit a mathematical analysis on the mechanical arm. The hydraulic system and structural materials were chosen for their strength, longevity, and operational efficiency. Furthermore, the model will be tested to verify the design and validate theoretical predictions. This study contributes to the development of a dependable and versatile excavator arm suitable for a variety of industrial applications, particularly those needing precision and power in a small footprint.

ME6 - Design of an Extraterrestrial Human Powered Rover
Team Members: Kevin Araiza-Chavez, Ryan Avila, Mark De Hoyos, Marco Hernandez, Angelina Moreno, Emilio Villarreal
Course Instructor and Faculty Mentor: Mr. Grady Isensee and Dr. Larry Peel

The Cosmic Javelinas team from Texas A&M University-Kingsville is participating in the 2025 Human Exploration Rover Challenge (HERC), a competition that requires teams to design and build human-powered rovers capable of navigating a course with 10 obstacles in under 8 minutes. The team's objective is to develop a rover with a total weight of less than 130 pounds and a braking system capable of holding the vehicle at a 30-degree incline. Custom-designed wheels are being developed to handle varied terrain, while CAD models and SolidWorks simulations are used to validate the design and ensure safety. Challenges such as aluminum welding and budget management are being addressed with external support from university resources, sponsorships, and grants. Through a structured design process and collaborative effort, the Cosmic Javelinas team seeks to create a competitive and reliable rover for the 2025 HERC competition.

ME7 - Mechanical Infrastructure for a Cumene Chemical Process
Team Members: Margarito Luna, Eloy Martinez, Autumn Robinson
Course Instructor and Faculty Mentor: Mr. Grady Isensee and Dr. Sangsoo Lee

In industry, Mechanical Engineers and Chemical Engineers must collaborate on major plant projects. The Chemical Engineers focus on the chemical process itself, while the Mechanical Engineers focus on the mechanical infrastructure. Specifically, Mechanical Engineers are often tasked with the design, analysis, and optimization of select mechanical components within a chemical process. Specifically, our work involves the design and analysis of the following: pumps and piping, controls, a heat exchanger, and a vaporizer. These sub-systems are all partially required in the production of Cumene from precursors. The principles of fluid dynamics, thermodynamics, heat transfer, and heterogenous chemical reactions will all be applied to this project. Dr. Matthew Alexander, a Chemical Engineering professor at TAMUK, has graciously provided the chemical process data to our team and has provided much guidance throughout the endeavor.

Multidisciplinary Projects

MD1 -TAMUK Smart Parking Lot System (EE/CS/CP)
Team Members: Marcos Mendoza, Destiny De La Garza, Diego Emiliano Trevino, Luis Lucio
Course Instructors and Faculty Mentors: Drs. D. Hicks and Dr. L. McLauchlan

The Smart Parking System is a real-time processing web for parking management on the Texas A&M University Kingsville campus. This project aims to reduce congestion and enhance student relations. During this project, the goal has been to implement Raspberry Pi to navigate sensory processing into UI web development. Making this interface will be achieved by Visual studio with extensions that are compatible with our project. This system will foster a more secure and manageable environment for everyone on campus. The University Police Department (UPD) will have better tools to monitor parking compliance and address unauthorized parking, while staff, students, and visitors will enjoy a more streamlined and worry-free parking experience. Implemented are the libraries of Angular and YOLOv5 to create processing and visualization.

The integration of solar-powered sensors ensures sustainability while minimizing infrastructure costs. Unlike expensive commercial solutions, this cost-effective, scalable system is tailored for universities, particularly those in smaller communities with limited access to advanced parking technology. The Smart Parking System leverages the Internet of Things (IoT) to provide a real-time parking management solution using mobile applications, sensors, and cloud-based databases. Designed to enhance student convenience and campus security, the system integrates ESP32-CAM modules for vehicle verification and a mobile interface developed with Android Studio and mapping software for navigation assistance. The project ultimately presents a forward-thinking approach to managing university parking in an efficient, user-friendly, and technologically advanced manner. The project is to be considered a success if the system detects both incoming vehicles and parking availability. Once the proper information is received, the data is to be transmitted to the users of the Smart Parking Lot System in real time through the Web Application**.**

MD2 - Transmission Pipeline and LNG Plant Design (CH/NG)
Team Members: Ramiro Carrillo, Jonathan Carrillo, Rafael Guerrero, and Octavio Montoya
Course Instructors and Faculty Mentors: Drs. M. Alexander and J. M. Cabezas

The purpose of this senior design project is to successfully design and simulate a transmission pipeline that feeds a liquified natural gas plant with pre-treated natural gas. Our sole objective is to use a refrigerant comprised of methane, ethane, propane, and nitrogen to cool natural gas down to –260° Fahrenheit. At that low temperature, natural gas consists of ≥95% methane, which can then be liquefied and is reduced in volume substantially, making it efficient to transport in high volumes. There are five main processes in our design, starting with the transmission pipeline which feeds our plant, to our sweetening process where hydrogen sulfide and carbon dioxide are extracted, then the dehydration process where water is extracted, going into our pre-cooled process and then finally our main cryogenic process where the natural gas is liquefied. Our target production rate is 1 MTPA (million tonnes per annum) and we are using ProMax to simulate and achieve this goal. The United States is a top exporter of LNG with Europe and Asia being the top importers.