Capstone Project Showcase

Project Program

Engineering Teaching Center
April 2026

GROUP	TEAM NAME	PROJECT TITLE	TEAM MEMBERS
A1	Chain Reaction	Rube Goldberg Machine to Open a Box Team Chain Reaction's project is a twelve-step Rube Goldberg machine designed to open a cardboard box lid by at least 45° within the required 10 ft × 10 ft × 8 ft footprint and a three-minute run time. The sequence begins with an alarm clock shaking rice into a weighted bag that triggers an air compressor gun, which winds a fishing line spool to release a Hot Wheels car down a looping track. The car cuts the line holding a loaded catapult, launching a golf ball into a nail board of water balloons. The released water then turns a wheel, setting off a chain of button and electromagnet releases that ends with a boxing glove mounted on a linear actuator opening the box. To ensure reliability, the team used feasibility calculations, decision matrices, and staged subsystem testing across four modular sections, reducing each step to its simplest mechanically sound form before integration. Run logs were used to identify and address failure patterns throughout, and once fully integrated, the machine completed 27 out of 30 successful runs, a 90% success rate.	Ryan Anderson Grant Brewer Evan Hudgins Eric Ly

GROUP	TEAM NAME	PROJECT TITLE	TEAM MEMBERS
AA26	BP Simulation Fixture	Dynamic Peristaltic Simulation Fixture This project focuses on the development and optimization of a pneumatic peristaltic testbed designed to simulate physiological esophageal motion for evaluating stent fixation. The system utilizes synchronized pneumatic pistons and silicone bands to replicate realistic circumferential pressure and cyclic loading conditions. Key design improvements target enhanced structural rigidity, precise actuator alignment, and increased durability under repeated operation. Analytical modeling and experimental testing were used to validate pressure consistency, actuation performance, and long-term reliability. This preliminary prototype enables controlled evaluation of material and system parameters before full-scale integration. The final testbed aims to provide a robust and repeatable platform for generating accurate, physiologically relevant data for stent performance assessment.	Arshiya Choudhary Joshua Chen Keven Reyna Sophie Ritter

GROUP	TEAM NAME	PROJECT TITLE	TEAM MEMBERS
AAA70	Fly Killer 2	Autonomous Flycatcher	Aliza Mehdi Vivian Pang

This project is an autonomous fly-catching device designed for indoor use. The device uses chemical bait to attract flies to a rotating top, which then captures them and deposits them into a lower collection chamber. Additionally, a compact electronics system controls the motor that drives the rotation. The device is about 20 inches in diameter and is designed to operate without user intervention. As a whole, these features create a compact and portable device for indoor fly control.

GROUP	TEAM NAME	PROJECT TITLE	TEAM MEMBERS
B2	Texas Trashformers	**Waste Collection Robot | ASME Student Design Challenge** This project was developed for the ASME Student Design Challenge, which uses a model playfield to simulate a dense urban environment with narrow pathways and limited maneuvering space. Our team designed a compact robotic system with mecanum wheels for omnidirectional movement, allowing it to navigate tight spaces while collecting waste and recycling materials from designated locations. A multi-degree-of-freedom robotic arm enables the robot to reach, grasp, and transfer materials into internal storage bins for sorting during operation. The robot then transports the sorted materials and deposits them at the appropriate destination within the course. A custom PCB and controller were developed to coordinate the drive, arm, and sorting subsystems into one integrated platform. The final design demonstrates a practical approach to automated waste management in small-scale urban settings.	Krishna Boreda Sanat Nair Ulises Rodriguez John Sharer

GROUP	TEAM NAME	PROJECT TITLE	TEAM MEMBERS
BB27	Robotic Hand	**Morphing Tendon-Driven Robotic Hand with Integrated Clutch Locking and Fingertip** This project presents the design and prototyping of a morphing robotic hand for dexterous manipulation on the Minimax Lab's KUKA robotic arm. The system uses a three-finger, tendon driven architecture with centralized actuation to reduce weight while maintaining coordinated motion. Unique features include rotating and radially extendable fingers, a compliant palm, and a mechanical clutch mechanism that enables joints to lock for increased stiffness under load. Additionally, one finger integrates a motor-driven screwdriver, allowing the hand to perform basic tool-based tasks without complex regrasping. The design prioritizes modularity and adaptability, enabling manipulation of objects with varying sizes and geometries. Current work focuses on subsystem-level testing and electromechanical validation to ensure reliable performance	James Berlander Andon Breitenfeld Emre Cetin Anunay Dixit Brian Lee Sreekar Ponnapalli

GROUP	TEAM NAME	PROJECT TITLE	TEAM MEMBERS
C3	Auto Cabin 2	**Project RECALL (Rear-Seat Emergency Child Alert & Location Link)** The Auto Cabin 2 senior design project successfully developed a reliable automatic alert system designed to detect when a child is left unattended in a vehicle and notify the caregiver to prevent heat related incidents. The finalized system integrates occupancy detection and wireless communication to monitor the presence of a child and trigger timely alerts. The physical subsystem consists of a pressure mat detection unit with an embedded microcontroller and battery, while the digital subsystem includes a mobile application that connects via Bluetooth to deliver real time notifications. The design was validated through iterative concept evaluation, risk analysis, and prototyping, followed by comprehensive testing under simulated vehicle conditions. Performance testing confirmed strong sensor accuracy, dependable Bluetooth connectivity, and fast response times. The completed system demonstrates an effective and practical solution for enhancing child safety in vehicles and reducing the risk of accidental heat	Ivan Colon Bermudez Miguel Herrera LJ Schluckwerder Niam Zaidi

GROUP	TEAM NAME	PROJECT TITLE	TEAM MEMBERS
CC28	Mini Wind Tunnel	Mini Wind Tunnel This project is a children's physical therapy device to help them develop motor skills. It uses a fan to blow objects into the air for children to catch, stimulating neuroplasticity with Dynamic Movement Intervention (DMI). This method aims to improve their standing, reaching, and grasping skills. The project is an improvement to similar products our sponsor has used before, such as the Elefun. Our project implements new features, such as a solid tube, a stronger fan, lights, and portability.	Emily Chau Daniela Escobar Brianne Gaines Simon Gross Bryan Pan

GROUP	TEAM NAME	PROJECT TITLE	TEAM MEMBERS
D54	Super Scramblers	Automated Scrambled Egg Maker This project's task is to create a machine that accepts a fresh, uncracked egg as an input and outputs fully cooked scrambled eggs. To accomplish this, the machine has different subsystems that complete each task associated with cooking scrambled eggs. These subsystems consist of a mechanical Keurig-style egg cracker, a funnel with spikes along the interior to puncture the egg yolk's membrane, a motor-driven spatula system to stir the egg mixture as it cooks, a hot plate and pan assembly to provide heat to the eggs, and a system to add seasoning based on user preference. All these subsystems are connected by electrical circuits that encode tasks such as regulating the heat of the hot plate, adjusting cook time based on the number of eggs entered, dispensing seasoning based on user input, and powering the motor-driven spatula. The machine is designed to output scrambled eggs to the same quality as if they were handmade, while allowing the user to save the time and effort required to perform the task themselves.	Reginald Blair Lance Kahl Erick Lara Braeden Price Emilio Valencia Lozano

GROUP	TEAM NAME	PROJECT TITLE	TEAM MEMBERS
DD29	Cabin Guardians	**A Retrofittable Multi-Sensor Fusion System for Pediatric Vehicular Heatstroke Prevention** Pediatric Vehicular Heatstroke is a critical safety problem, as parked vehicles can overheat within minutes, and most cars lack detection systems once powered off. To address this, we developed an autonomous child detection and alert system with retrofit compatibility with existing vehicles. The system uses a dual-module architecture that consists of an OBD-based power unit and a headrest-mounted module integrating mmWave radar, thermal infrared sensing, and CO2 respiration detection. By cross-referencing the three sensors, the device achieves high detection sensitivity while maintaining a low false alarm rate. Upon confirmation of an occupant, the system triggers local strobe and buzzer alerts to immediately notify nearby individuals of the emergency.	Lawrence Gomez Pranav Govil Jae Teh Lindsay Yan Yuyun Yu

GROUP	TEAM NAME	PROJECT TITLE	TEAM MEMBERS
E5	Rock Wall Harness	NAPA Center Pediatric Rock Wall Harness Children with neurological conditions such as cerebral palsy often benefit from participating in rock wall climbing as a part of physical therapy, requiring more specialized support than standard climbing harnesses provide. This project develops a pediatric climbing harness tailored for therapeutic use at the NAPA Center, a pediatric therapy clinic, addressing shortcomings in the existing system related to adjustability, usability, and trunk support. Five distinct harness concepts were generated and systematically narrowed to a final design using engineering design methods such as customer needs analysis and morphological matrices. The selected design features a full-torso support structure built with load-rated nylon webbing, double back buckles, and cushioned padding at contact points, accommodating children of all ages and sizes. Risk analysis, iterative prototyping, and therapist feedback guided design refinements, culminating in a functional prototype designed for the NAPA Center.	Collier Bryant Ameya Dhumal Rodolfo Garza Sam Hinkel Isaac Zendejas

GROUP	TEAM NAME	PROJECT TITLE	TEAM MEMBERS
EE30	Team Maze Runners	**NAPA Center Wall Mounted Maze for Pediatric Therapy** The NAPA Center provides pediatric physical, occupational, and speech therapy in a playful setting designed to support children's developmental progress. A key challenge in pediatric therapy is maintaining child engagement during motor skill activities, as therapists are often unable to simultaneously manipulate and present motivating toys while safely providing the hands-on assistance required during complex motor tasks. To address this, we designed a wall-mounted maze designed to provide a fun, interactive way to encourage repeated motor practice while improving the quality and impact of each therapy session. The maze features a forest theme with tactile, audio, and visual components that stimulate multiple senses, creating a more immersive experience for young patients. These multisensory elements work together to sustain attention, promote active participation, and support the development of essential motor skills.	Jack Craig Andrew Eaton Allison Nguyen Rhea Parker Maximillian Yu

GROUP	TEAM NAME	PROJECT TITLE	TEAM MEMBERS
F6	Enpro Leak Detection	**Optical Leak Detection for Plate-and-Frame Heat Exchangers** This project developed a high-resolution, camera-based system to detect internal leaks in plate-and-frame heat exchanger plates, replacing traditional chemical and manual inspection methods. The system our team developed captures detailed images of plate surfaces and uses machine learning to automatically identify cracks and defects. A horizontal imaging configuration was implemented to ensure consistent lighting and camera positioning, improving detection accuracy and reducing operator subjectivity. A reduced-scale gantry prototype was built to validate the imaging and machine learning approach. Testing included image processing, dataset development, and training convolutional neural networks for defect detection. The resulting system demonstrated a safer, more efficient, and scalable approach to industrial heat exchanger inspection.	Benjamin Aguayo Colin Covington Adrian De Leon Julian Gonzalez

GROUP	TEAM NAME	PROJECT TITLE	TEAM MEMBERS
FF59	Vector Apex	**Reducing Aerodynamic Wake Turbulence While Maintaining Aerodynamic Efficiency in a 1:24 Scale Formula 1 Car** Modern Formula 1 cars generate substantial aerodynamic downforce but produce turbulent wakes that hinder close racing and overtaking. This project focuses on designing and validating a 1:24 scale Formula 1 car compliant with FIA 2026 regulations to reduce wake turbulence while maintaining aerodynamic efficiency. The design process integrates aerodynamic theory, CFD-guided refinement, and a modular approach to evaluate how individual components influence downstream airflow. The resulting configuration features moderate-camber wings, conservative diffuser expansion, and smooth body transitions to weaken vortices and improve pressure recovery. This project includes prototype fabrication, CFD simulation, and wind tunnel experimentation using wake measurements and flow visualization techniques. Project success is measured by achieving a 10% reduction in wake turbulence while maintaining a lift-to-drag ratio above 3.0, contributing to improved race competitiveness.	Tashdiq Ahmed Richard Mitchell Casey Nguyen Daniel Uribe-Rodriguez

GROUP	TEAM NAME	PROJECT TITLE	TEAM MEMBERS
G62	Robotuners	**Developing an Automated Calibration device for the torsional springs used in force-controlled robotics.** The torsional springs within Roboligent's Series Elastic Actuators (SEAs) are critical components for their commercial humanoid robots, which use Vision-Language-Action control models in conjunction with precision-calibrated actuator feedback. Currently, their manual calibration process for these springs is slow, requires high operator intervention, and yields limited stiffness data. Our solution is an automated, worm-gear-driven machine that uses a motor and a non-backdrivable gearbox to apply precise torque. Operated using a GUI, this system enables near-continuous data collection via an integrated torque sensor and encoder, dramatically cutting calibration time and minimizing operator input. The approach has proven successful, as the design has been validated through CAD modeling, physical prototyping, and user trials. Overall, the device will directly benefit Roboligent by improving SEA calibration consistency, strengthening the performance of their humanoid robots, and providing a standardized tool for streamlining SEA joint assembly.	Al Waled Al Shamari Kevin Contreras Luke Pronga Tianqin Puyang Cameron Stump

GROUP	TEAM NAME	PROJECT TITLE	TEAM MEMBERS
GG32	NAPA 3D Print Wheelchair	**3D Printed Wheelchair Modifications for Children with Hemiparesis** This project addresses a gap in pediatric rehabilitation by developing a low-cost wheelchair tailored for children with hemiparesis, a condition that limits strength and coordination on one side of the body. Many existing mobility devices used in pediatric physical therapy clinics are not optimized for unilateral propulsion, limiting their effectiveness in targeted rehabilitation. Our team is modifying an open-source, 3D-printed wheelchair to support one-sided operation while promoting proper posture and controlled movement. The design emphasizes adjustability, durability, and ease of use for both patients and clinicians in a therapeutic setting. By enabling repetitive, task-specific mobility training, this device aims to support motor learning and functional therapy outcomes.	Maya Adams Sam Malone Jacob Strelitz Cristian "Fitch" Torres

GROUP	TEAM NAME	PROJECT TITLE	TEAM MEMBERS
H60	Shock Dynamometer	**Cost-optimized Shock Dynamometer for Suspension Characterization in Formula SAE** Suspension performance is critical to Formula SAE vehicle dynamics, with shock absorbers playing a key role in controlling tire contact and handling behavior. Accurate characterization of shock performance requires a shock dynamometer, which measures force–velocity relationships under controlled conditions. However, commercial dynamometers are often prohibitively expensive, limiting access for many teams. This project develops a low-cost shock dynamometer capable of operating within the force, velocity, and stroke ranges representative of FSAE applications while maintaining ±1% measurement accuracy. The system uses a NEMA 42 closed-loop motor with a 1:5 planetary gearbox as well as a data acquisition and control system controlled by an Arduino and Teensy-based system, enabling closed-loop testing and simple data export for team workflows. The final design achieves a total cost under $1,400 and delivers a fully manufacturable, open-source solution for broader FSAE adoption.	Tanu Gadiyar Nathaniel Holman Constanza Blanco Ali Jensen

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HH33	NAPA Rope Pull	NAPA Center – Rope Pull Device The NAPA Center is a therapy clinic in Austin, TX that offers individualized physical, occupational, and speech therapy programs to a pediatric population. A core component of their physical training involves variable-resistance rope pulling to help patients improve their grip strength and upper-body coordination. While commercial trainers exist, they are often cost-prohibitive and bulky, well-suited for gymnasium environments rather than clinical spaces. Our project delivers a market-first interpretation of the rope-pull trainer: a cost effective, compact, and engaging solution specifically tailored for pediatric therapy.	Rahel Bekele Robert Burnett Hector Moreno Elisante Msengi

GROUP	TEAM NAME	PROJECT TITLE	TEAM MEMBERS
I9	Trident Clamp	**The Trident Clamp: A Non-Invasive Power-Siphoning Solution for Live Romex Conductors** Team Trident Clamp is developing a safe, reliable, and non-invasive method for extracting low-voltage power from live 12 and 14 AWG Romex conductors. The device utilizes an insulation-piercing assembly featuring a 3D-printed plastic housing and aluminum bus bars to siphon power without interrupting existing circuits or requiring permanent infrastructure modifications. Designed for military and disaster relief applications, the product facilitates the integration of Powerline Communication (PLC) devices in time-sensitive environments where power deactivation is not feasible. The final design prioritizes a low part count and simple 3-step installation process achievable with standard hand tools in under five minutes. Preliminary physical trials have validated the design's ergonomics, its ability to pierce through sheathing, and its ability to draw power.	Ben Baker Reagan Cardoza Azim Daradiya Reyes Mata Alex Saenz

GROUP	TEAM NAME	PROJECT TITLE	TEAM MEMBERS
J10	Card Holders	Insurance Card Scanner Healthcare providers lack efficient, standardized, and reliable methods to capture and store patient insurance information in electronic medical records. To remedy this, JorieAI requires a hardware solution to deploy a front-end software payload that leverages their optical character recognition platform to rapidly and seamlessly harvest and store insurance information from patient insurance cards. After evaluating user and admin needs, we developed a prototype file-watching python script that pairs with a physical card scanner. When scans are saved to the admin computer's hard drive, the program uses tesseract OCR to read the pdf, and stores the fields on the card in a structured JSON file. Rigorous regex and common OCR character corrections were manually coded into the program to give the prototype software the ability to scan multiple cards from different providers.	Davis Chen Blanca Cuesta Ayush Deshmukh

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JJ34	Modular End-Effector	Robotic Soldering End-Effector Printed circuit boards (PCBs) can be easily used to house embedded sensors and electronics in a compact manner, making them a central topic in many recent biomechanical applications. Our project sponsor, Dr. Fangzhou Xia of Minimax Lab, has incorporated several PCBs into an ingestible pill that can measure a patient's biometrics from inside their body. Our research, which is done in collaboration with Minimax Lab, spans several end-effector designs and focuses on developing a system - one that will integrate with the Kuka iiwa LBR - capable of streamlining the process of soldering together said PCBs to free up lab personnel for other testing and work. The purpose of our project is therefore to automate the manufacturing of an electronic pill, focusing on the soldering of the millimeter-scale electronic boards (<50 mm^2 surface area). Our end-effector prototype is a pre-programmed proof of concept that uses an LBR KUKA iiwa robotic arm for movement and positioning, with human input still required to pick and place the PCBs themselves. Through iterative design, our team was able to develop an end effector that could effectively solder PCBs at the millimeter scale.	Josh Haase Kennan Li Marvin Luo Avina Pandit Enrique Rodriguez Eddie Wang

GROUP	TEAM NAME	PROJECT TITLE	TEAM MEMBERS
K11	NASA Artemis: HERC	**Design and Validation of Lightweight Rover Subsystems for the NASA Artemis Human Exploration Rover Challenge** Our project focuses on the design and validation of lightweight rover subsystems for the NASA Artemis Human Exploration Rover Challenge, with primary emphasis on a team fabricated non pneumatic wheel system. The subsystem designs are being developed within the context of the full rover assembly to meet requirements for mobility, compact storage, safety, and manufacturability. A major part of the project has been reducing risk by identifying likely failure points and refining the design before fabrication. To support this process, we are using simulation and planned physical testing to evaluate structural behavior, traction, and terrain interaction, especially for the wheel system. These validation efforts help compare predicted performance with real world behavior and guide further design improvements. The end goal of the project is to deliver reliable, lightweight, and transportable rover subsystems that support an effective overall rover design for simulated lunar terrain.	Kevin Diep Sam Fralick Lex Pham Daniel Prescott Nathan Sheu

GROUP	TEAM NAME	PROJECT TITLE	TEAM MEMBERS
KK35	Red Cross Cooling Station	**Red Cross Cooling Stations: A Rapidly Deployable Shelter for Heat Emergency Response** Climate change is increasing the frequency and severity of heat waves, which in turn has created an uptick in severe heat-related illness and death. This creates an urgent demand for effective emergency cooling solutions. The scope of this project encompasses the development of a portable cooling station for the International Red Cross to provide emergency relief capacity for 20 people. We identified an inflatable tent with commercial air conditioning units and a diesel generator as the leading solution, balancing cooling performance, portability, and cost; the final design accommodates 20 cots with adequate medical access pathways and can be deployed in under 2 hours by a 4-person team. To validate our final design, we performed finite element thermal analysis and proof of concept testing in a storage shelter at UT Austin's Brackenridge Field Lab. This cooling station addresses a critical gap in humanitarian emergency response capabilities as heat-related health risks continue to escalate globally.	Simon Bebak Alexander Kelly Jason Marek Matthew Na Rickie Willie

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L61	SLICE	**Structured Light for Improved Camera Estimation** Robotic surgical systems like the da Vinci platform rely on stereo endoscopic cameras that provide surgeons with qualitative depth perception but offer little quantitative depth data usable by computational systems, limiting the development of semi-autonomous surgical robotics. Structured light is a well-established technique for quantitative depth estimation, but existing systems require active projection hardware, such as lasers, projectors, or digital micromirror devices, that are incompatible with the size and optical constraints of minimally invasive endoscopes. This project investigates a passive structured-light approach in which a patterned optical mask is placed over the LED illumination already present on surgical endoscopes to generate depth-informative images without additional hardware. To validate this concept, a fully 3D-printed test rig was designed and fabricated that holds the camera, light source, and passive mask in a fixed configuration while an internal platform translates to controlled, caliper-measured depths. The system was validated through both qualitative human perception surveys and quantitative computational methods, including a CNN regression model and a phase-based depth calibration pipeline. Ultimately, this work establishes a low-complexity, physically realistic experimental framework for evaluating passive structured-light	Lambert Ike Caden Page Nikhil Pai Robin Sambuis

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M13	Battery	**Lithium-Ion Battery Fire Detection and Prevention System** This project focuses on preventing lithium-ion battery fires in residential settings by addressing the problem before ignition occurs. Unlike traditional fires, lithium-ion batteries can internally sustain combustion, making them extremely difficult to put out. To solve this, the team developed a compact, user-friendly device that monitors battery temperature during charging using a thermal infrared camera. If unsafe temperatures are detected, the system automatically cuts power to the charger and alerts the user through alarms and mobile notifications. The design emphasizes ease of use and real time monitoring. Overall, the project provides a practical safety solution to reduce the growing risk of lithium-ion battery fires.	Kenny Cruz Audrey Dorries Emma McNatt Caleb Read

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MM36	Bioprinters	**3D Printed Vascularized Tissue** Engineered tissues require channels that mimic vasculature or blood vessels to support nutrient transport, waste removal, and long-term cell viability. Dr. M. Nichole Rylander's lab has developed various methods to fabricate these vascular channels to study cancer cell proliferation in tissues. However, current manufacturing methods are limited in their ability to efficiently produce three-dimensional complex vascular structures representative of human physiology. Our team has developed a laboratory procedure intended to create these vascular platforms with improved resolution and time efficiency. This work will enhance the lab's ability to build vasculature that supports broader medical applications in tissue engineering and disease modeling.	Eesha Bilal Rachel Dong Kelly Shih

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NN37	ATAC Perimenopause	**Mechanical System for Improving Lymphatic Drainage in Perimenopause** Recent research shows that when estrogen drops as a person ages, type I collagen increases leading to tissue that is stiffer, less hydrated, and less mobile. Since superficial fascia tissue needs to glide for lymphatics to pump effectively and clear out toxins and control hormones people encounter pain, swelling, and poor quality of life. Mechanical massage has been shown to improve lymphatic flow and improve quality of life, but there is not a system to apply the appropriate mechanical parameters to improve health. The goal of this project is to develop a mechanical data acquisition device to apply the appropriate mechanical properties to regulate lymphatic flow in a manner that improves the mechanical properties of the fascia and hormone levels.	Courtney Bui Tessa Kasson Alex Mendoza Amar Saini

GROUP	TEAM NAME	PROJECT TITLE	TEAM MEMBERS
O14	Future Engineers	**Interactive STEM Playground Boards for Toddler Outdoor Play** The Future Engineers project focused on creating vertical playground busy boards that introduce toddlers aged 1-3 to foundational STEM concepts through hands on play. The boards feature three interactive modulus: a counting maze where children slide a monkey cutout along a numbered fruit tree mural to build early numerical skills, a planetary gear system driven by a hand crank that showcases rotational motion and cause-and-effect through planet shaped interlocking gears, and a color coded bell board where children can create music by following simple song sequences. Each module was designed to stimulate both fine and gross motor development. Engineering concepts, such as force and motion, become tangible and intuitive through play. Together, the three games create a cohesive play experience that lays early groundwork for future STEM learning.	Natasja Beijen Siddarth Bhargav Julie Hernandez Tejas Sachdeva Samik Singh

GROUP	TEAM NAME	PROJECT TITLE	TEAM MEMBERS
OO38	Wind Power Desalination 1	**Viability of Wind-Powered Reverse Osmosis Desalination with Mechanical and Electrical Drive Systems** Amidst ongoing efforts to resolve worsening water scarcity in West Texas and other regions, the integration of plentiful brackish groundwater and excess wind power has emerged as an opportunity to convert low-value resources to useful drinking water. This project explores the viability of both mechanically driven and electrically powered reverse osmosis (RO) desalination systems that source energy from wind turbines. Factors considered in the analysis include the cost relative to water produced, energy efficiency of the system relative to the power produced by the wind turbine, and accommodations for installation, operation, and maintenance. Variations in scenarios necessitating different commercial off-the-shelf (COTS) parts may be toggled within a decision support system (DSS) that offers comparisons of viability factors based on input characteristics including scale of production, groundwater depth, and feedwater salinity. While future analysis would benefit from accounting for additional input factors to improve precision, our scenario building suggests the benefits of turbine generation and electrical pump hardware lend themselves more strongly to desalination than mechanical systems in all but the smallest scales of operation.	Kahiso Erickson Michael Kanu Amelia Modesto Micah Yang Kulmiye Yonis

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P15	AFD Wildcard	**A Modular Fire Suppression System for Controlling Thermal Runaway in Lithium-Ion Battery Electric Vehicles** This project focuses on the design of an electric vehicle (EV) fire suppressant pipe system to mitigate the risks associated with lithium-ion battery fires. As EV adoption increases, thermal runaway events present significant safety challenges due to their rapid escalation and resistance to conventional suppression methods. The proposed system utilizes strategically routed piping to enable rapid deployment of a fire-suppressing agent directly at the source of ignition. Key design priorities include fast response time, efficient pressure-driven distribution, and durability under extreme temperatures. Additional considerations emphasize a modular architecture, safe standoff distance from the fire source, adaptability across various vehicle platforms, and minimal added weight. The expected outcome is a conceptual design that enhances fire containment, improves system reliability, and contributes to overall EV safety.	Pablo Diaz Emma Giles Dennis Kanash Adbeelners Sauceda Mia Thompson

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PP39	Fly Killer 1	**Smart Fly Trap with Vision Processing & Intelligent Actuator Control** Flying insects create health concerns and discomfort in indoor spaces, and many existing solutions are noisy, unsafe, and waste energy. This project introduces an automated fly-capturing device that uses computer vision to detect flies. Once flies are detected, the machine's intelligent Raspberry Pi controller activates the central fan suction system. By turning the motor on selectively rather than running continuously, the system significantly reduces energy consumption. The device combines sensing, actuation, and an attractant-based capture method to efficiently trap flies in a novel way.	Disha Udtha Nathan Deolloz Trey Hornsby Alan Wen

GROUP	TEAM NAME	PROJECT TITLE	TEAM MEMBERS
Q62	Sulzer Squad	**One-Handed Indoor Mobility Trainer for Children with Hemiparesis** This project focuses on designing an indoor wheelchair for children ages 4 to 6 with hemiparesis. Hemiparesis is a condition that causes weakness and reduced motor control on one side of the body. The goal was to create an affordable device that supports safe, independent movement while improving maneuverability and reducing caregiver assistance in home environments. Existing pediatric mobility options often have limitations in durability, indoor usability, or one-handed operation, and many commercial solutions are too expensive for most families. Our team explored multiple design concepts to develop a solution that is simpler, safer, easier to manufacture, and significantly more affordable than many existing alternatives. Through design and prototyping, the project delivered a practical, low-cost mobility solution that promotes greater independence for young children.	Shruthi Dandamudi Sofia Frey Brady Goar Larry Godfrey Christian Rude

GROUP	TEAM NAME	PROJECT TITLE	TEAM MEMBERS
QQ43	Human Neck Phantom Team	**Design and Development of a Mechatronic Head-Neck Phantom for Simulating Swallowing** This project presents the mechanical and mechatronic design of a head neck phantom intended to replicate oropharyngeal swallowing for dysphagia research. Current clinical diagnostic methods for dysphagia rely heavily on human testing, which is costly, time limited, and variable across subjects. The goal of this project is to redesign and improve an existing prototype into a compact, anatomically realistic, and repeatable phantom capable of simulating head, neck, and laryngeal motion while interfacing with a piezoresistive strain sensor. The design process followed a structured engineering methodology including customer needs assessment, House of Quality analysis, function decomposition, concept generation, morphological analysis, and concept selection using weighted Pugh charts. Four concept variants were evaluated against criteria such as motion repeatability, laryngeal trajectory accuracy, manufacturability, durability, cost, and portability. The selected final design integrates a multi-axis larynx actuation system using micro linear actuator, and a head–neck tilt subsystem supported by servo motors, linkages and a ball- and socket joint.	Cassie Mai Ryder Philips Joseph Romero Michael Salas

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R58	Radiation Shielders	Radioactive Material Storage Container This project is being conducted in partnership with Los Alamos National Laboratory and focuses on designing and prototyping a compact shielded container for storage of radioactive material. The proposed design improves upon the currently used design by replacing a cumbersome bolt-secured lid with a single motion twist-lock mechanism to reduce operator difficulty in opening the container which minimized the time exposed to the radioactive container. Additionally, the proposed design improves upon the shielding provided by the original container by adding neutron shielding in the form of a 3D-printed Nylon sleeve. The project included radiation testing of a prototype container, evaluating reduction in gamma and neutron radiation compared to the original container. This work ultimately supports the development of a safer, more ergonomic nuclear material storage solution for continued refinement by the project sponsor.	Jacob Kessler Jack Moyer Jeeho (Josh) Pahng Isiah Serenil

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RR41	Jaws	**Mechanical, Scaled Jaws of Life** The Mechanical, Scaled Jaws of Life addressed the limitations of traditional hydraulic and eDraulic Jaws of Life–namely, weight, size, and deployment complexity–by proposing a purely mechanical rescue tool that maintains sufficient cutting and spreading capability for less-critical extrication scenarios. Traditional Jaws of Life systems rely on hydraulic or battery-powered actuation to achieve high cutting forces, which contributes to their mass and bulk. In order to solve these current issues, the resulting design is a lightweight, cordless, electrically nonconductive, and cost-effective form of the Jaws of Life with efficient cutting and spreading capability. The product was manufactured using FDM 3D printing, laser cut AR500 steel, DMLS 3D printing, and off the shelf parts. The design was tested using common NFPA 1936 standards for cutting, ergonomic evaluations, and repeated durability testing.	Nicholas Bartlett Ethan Doehler Paul Eguia Chris Riley Josh Teall

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S40	Pedal Pushers	One-Pedal Drive This project develops and tests a one-pedal drive control system using a hardware-integrated simulation platform. A physical pedal sends input to an Arduino controller, which translates pedal position into acceleration, coasting, and braking behavior within a Python-based vehicle simulation. The system provides real-time feedback, including velocity and driving state, through an LCD display. An ultrasonic sensor adds environmental awareness by detecting nearby obstacles and triggering simulated braking when necessary. The simulation also models different road conditions, allowing analysis of how traction and friction impact control performance. Overall, the platform enables evaluation of responsiveness, stability, and safety while remaining low-cost and safe for laboratory testing.	Jose Saucedo Max Shen Mateo Valadez Dylan Zu

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SS42	Lake Guardians	**The SS Guardian: A Remote-Controlled Airboat for Macroplastic Debris Collection in Central Texas Waterways** Microplastic pollution in freshwater ecosystems largely originates from the breakdown of larger plastic debris, making macroplastic interception a meaningful upstream intervention. In Central Texas waterways such as Lady Bird Lake, surface debris is currently removed by the Austin Watershed Protection crew through daily manual cleanup, supplemented by occasional Keep Austin Beautiful volunteer events — efforts that are effective but labor- intensive and limited in reach. To support these crews, the Lake Guardians designed and built the SS Guardian, a remote controlled airboat capable of navigating through aquatic vegetation to collect floating macroplastic debris. The boat features a fiberglass-reinforced XPS foam hull, a shrouded 10-inch nylon propeller driven by a brushed DC motor, an air rudder for low-speed maneuverability, and a custom TPU-printed rake engineered to scoop debris without entangling on vegetation. Designed and built under a $250 budget using accessible materials and common manufacturing methods, the SS Guardian is a scalable, low- cost tool to extend the reach of existing watershed protection efforts and reduce the macroplastic burden contributing to microplastic pollution in Central Texas waterways.	Derek Morales Christopher Rodriguez Ethan Salazar Alexander Vu Sarah Wu

GROUP	TEAM NAME	PROJECT TITLE	TEAM MEMBERS
T63	Phantoswallow	**A Mechatronic Neck Phantom for Dysphagia Monitoring** This project focuses on the design and development of a mechatronic neck phantom for dysphagia monitoring and wearable sensor validation. Current clinical methods for evaluating swallowing disorders are often invasive, costly, and difficult to standardize, creating a need for a controlled and repeatable testing platform. The proposed system replicates key swallowing motions, including laryngeal elevation and chin-tuck rotation, using a combination of stepper driven linear actuation and servo-controlled rotational mechanisms. The design emphasizes structural rigidity and deterministic motion to ensure consistent and repeatable performance across testing cycles. Preliminary subsystem testing confirms that the system meets key displacement and angular range requirements while remaining within budget constraints. This platform enables reliable sensor calibration and supports future research in non-invasive dysphagia monitoring.	Leonardo Hernandez Anika Rajkumar Eli Saldana Jarrod Tung

GROUP	TEAM NAME	PROJECT TITLE	TEAM MEMBERS
TT44	Lake Austin Water Cleanup	**Passive Device for Macroplastic Removal in Lake Austin** This project addresses plastic pollution entering Lake Austin through urban runoff, where macroplastics (pollutants ranging in size from 5–50 mm) threaten aquatic ecosystems and degrade into corrosive, persistent microplastics. Existing cleanup methods are reactive and labor intensive, highlighting the need for a preventative, low maintenance interception system. Our selected design is a floating, anchored device which utilizes a battery powered conveyor belt, a Styrofoam plywood composite flotation platform, a storage bin, and two ropes with foam barriers which together serve to capture debris. The conveyor includes a sealed drive belt and an adjustable pitch to capture both surface level and slightly submerged plastics. The scaled prototype was manufactured using 3D printing and commercial components and tested under controlled flow and wind conditions using a factorial design of experiments. Performance was evaluated by measuring the mass of plastics collected under varying environmental conditions. The system provides a sustainable, adaptable method for intercepting plastic waste before it disperses and harms the lake ecosystem	Peter Geppert Trevor Van Husen Yanely Molina Asher Roohullah Mary Stripling

GROUP	TEAM NAME	PROJECT TITLE	TEAM MEMBERS
U20	Fasten Forward	Assistive Clothing Buttoning Device Our project focuses on improving a clothing buttoning device that currently exists on the market to specifically help people who experience tremors. We have implemented an internal spring mass dampening system to counteract the frequency of a tremor. An angle adjuster was also added to be more user friendly. Our prototype contains both these mechanisms and was personally tested by users who experience these tremors. In future work, these mechanisms will be downsized to be more portable as well as continued research on finding an optimal dampening system.	Benjamin Avilez Ushma Dhakal Carolina Olaya Gallo Ngozi Onya Phoenix Saavedra

GROUP	TEAM NAME	PROJECT TITLE	TEAM MEMBERS
V21	Auto Cabin 1	**On-Board Detection System & Preventing Hot Car Deaths** Hot-car fatalities remain a serious yet preventable safety issue caused by occupants being exposed to rapidly increasing vehicle cabin temperatures after a car is parked. This project presents the preliminary design of a low-cost, fail-safe onboard safety system that detects vehicle occupancy and initiates intervention before conditions become life-threatening. The proposed system integrates an infrared (IR) camera, a CO_2 sensor, and temperature sensing to enhance detection reliability while minimizing false alarms through multi-sensor validation.	Fernanda Gonzalez (Jerry) Yizhou Hao Nicolas Montoya Celina Saenz David Velazquez

GROUP	TEAM NAME	PROJECT TITLE	TEAM MEMBERS
VV45	Off-Grid Sterilization	**Off-grid sterilization of surgical equipment** It has been identified that approximately 5 billion people worldwide lack access to safe surgical care; within this humanitarian issue, one of the primary concerns is effective instrument sterilization. Instrument sterilization helps reduce risk of surgical site infection and has historically been difficult to achieve in areas with limited access to utility infrastructure. Boiling water, steam autoclaves, and chemical disinfectants have been used as alternatives, but each presents individual challenges in sterilization standards, resource consumption, and rural availability. We discuss manufacturing work, in the form of electrical and user-interface prototypes, to expand the viability of an induction heater for sterilization. Combined, we demonstrate a small, portable surgical instrument sterilizer that can operate in limited-utility environments and show that instrument sterilization is plausible with an intermittently charged, battery-powered setup. We outline the next steps in testing, which involve tuning a high-frequency power stage and refining our user interface. It's expected that a commercialized version of the device under development would be used by humanitarian aid missions to ensure cleanliness in surgical procedures, or by militaries to allow for better rapid response.	Austin Brown Andrew Cloran Charles Gundlach Jonathan Kacines Tyler Yan

GROUP	TEAM NAME	PROJECT TITLE	TEAM MEMBERS
W31	Rolling Compression	**Adjustable Rolling Compression Device for Pediatric Therapy Applications** Our project focuses on the design and development of a rolling compression device that delivers deep-pressure sensory therapy for children with sensory processing challenges. This need was identified through collaboration with the NAPA Center, which lacks a compact, adjustable, and cost-effective solution for consistent therapy across a wide range of patient sizes. The final design features a four-roller system with adjustable compression force, interchangeable rollers of varying textures, and a compact, mobile frame to improve usability and adaptability. The device was developed using structured engineering methods, including functional modeling, design by analogy, and iterative prototyping. These features allow a single therapist to quickly adapt the device to individual patients while maintaining safety and ease of use. Overall, our solution improves accessibility and effectiveness of compression therapy in pediatric settings.	Will Shoup Ralph Steele Luke Weinzierl

GROUP	TEAM NAME	PROJECT TITLE	TEAM MEMBERS
WW51	Doggie Doo	**Autonomous Robot for Pet Waste Detection and Collection** This project focuses on the design and development of a proof-of-concept autonomous robotic system capable of detecting and collecting canine waste in residential backyard environments. The prototype integrates a differential drive mobile platform, a vision-based perception pipeline using a YOLO object detection model, and a mechanically actuated collection mechanism consisting of a bucket and sweeper. A layered control architecture separates Python-based high- level perception and decision making from low-level embedded microcontroller control, enabling reliable detection, navigation, and coordinated actuation. Initial testing demonstrates the feasibility of the overall system while highlighting areas for improvement, particularly in the mobility performance on grass and uneven terrain.	Joshua Caratao Nafee Karim Rheigina Quijote Ethan Snider Jaci Stokes

GROUP	TEAM NAME	PROJECT TITLE	TEAM MEMBERS
XX55	Clean the Filter	**Automatic Pool Filter Cleaner** The cartridge filter is a common device used to ensure the cleanliness of residential and commercial pools alike by sequestering contaminants from the water. These filters must then be cleaned to remove the contaminants; a time and labor intensive process. In this project, our team has created a device to automate this contaminant removal process, cleaning the filter without user intervention. The device uses recoil force from a water jet to rotate the filter. Rising water levels within the device's watertight enclosure causes a float to rise and push the filter upwards, ensuring coverage along the filter's entire height.	Alex Gutierrez Aidan Hodgin Justin Hung Ethan Schutt Tyler Utsumi

GROUP	TEAM NAME	PROJECT TITLE	TEAM MEMBERS
Y24	ABCD Engineering	Counterfeit Bolt Detection Counterfeit and/or substandard bolts pose significant safety and financial risks across industrial and research applications, yet screening these bolts in bulk prior to implementation poses a problem due to the lack of a rapid, non-destructive, and reliable verification method. This project addresses that gap by developing an automated, portable system capable of assessing whether a bolt meets defined strength thresholds without inducing damage. The selected final design integrates electrical, magnetic, and mass testing as primary testing modes. These measurements are converted to intrinsic properties, namely conductivity, magnetic permeability, and density, respectively. These intrinsic properties are then correlated to a tested bolt's strength relative to an expected value, and the result output to the user as a pass/fail. A modular, capsule-based mechanical architecture was developed in CAD to support consistent bolt positioning, manufacturability, and potential future scalability.	Donovan Douglas Bryce Giese Abigail Gonzales Conor Harris

GROUP	TEAM NAME	PROJECT TITLE	TEAM MEMBERS
YY48	Wind Power Desalination 2	**Wind Powered Groundwater Desalination** Integrating renewable power to generate potable water has been a growing topic of interest over the past decade. This report details work on a wind-powered desalination project that utilizes the reverse osmosis process. Three options were explored for this—one mechanically driven, one electrically driven, and one “hybrid” that is a combination of the two. These three differing drives have unique advantages and challenges. The overall aim of this project was to design and compare these different reverse osmosis systems and examine the advantages and disadvantages of each system including energy requirements, cost, and water output consistency.	Amogh Herle Sofia Ijazi Kevin Ren Kyler Sanders

GROUP	TEAM NAME	PROJECT TITLE	TEAM MEMBERS
Z25	Trebuchet	**Continued Development of the Trebuchet** Trebuchets were widely used in warfare during the Middle Ages; however, modern technology now enables more advanced material selection and performance analysis. In its most fundamental form, a trebuchet is a mechanical system that converts gravitational potential energy into kinetic energy to launch a projectile. The objective of this project was to design and construct a trebuchet within specified design constraints and budget limitations. By applying engineering principles and modern analytical tools, our goal was to maximize energy transfer and projectile range while ensuring consistent and repeatable performance. Throughout iterative refinement and experimental testing, we were able to collect data to contribute to the research of the past team, providing additional areas of improvement for future teams.	Jorge Cavazos Chloe Ho Jacob Oganda Kinny Reyes

GROUP	TEAM NAME	PROJECT TITLE	TEAM MEMBERS
ZZ67	Base Emergency Power	Base Emergency Power Hub A rapidly deployable battery-powered distribution system that delivers safe, reliable electricity to critical devices and community loads during mass outages—without requiring permanent installation or grid interconnection. Designed for fast deployment, it enables immediate power access in natural disaster and emergency scenarios.	Inoo Jo Ian Kao Manoj Oddiraju Mihir Saripalli