ACME: Additive Construction Materials Experimentation


FACULTY ADVISOR: Dr. Kraig Warnemuende

The 3D printing concrete industry has been on the rise in recent years and the need for advancing and improving the quality and efficiency of concrete printing is becoming necessary for study and safety design. The purpose of ACME is to test and improve on the 3D printer while implementing various practices seen in industry. The 2024-2025 ACME goal is to improve the machine in areas such as the Pump, Extruder, G-Code and printer movement. Along with that, the team seeks to expand and improve on cementitious mix designs along with replicating the current industry process of Quality Assurance and Quality Control.

E-Gen: Project Electrogenesis
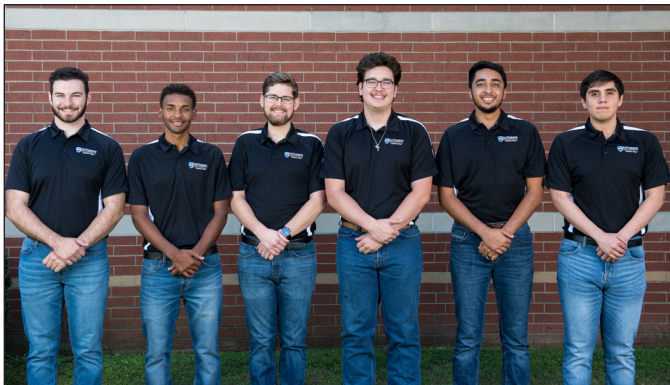
FACULTY ADVISOR: Dr. Joonwan Kim

E-Gen is dedicated to pioneering the designs and processes necessary for semiconductor fabrication at LeTourneau University. The feasibility of in-house development of high-quality semiconductor devices is being pursued through processes such as oxidation, etching, and photolithography. In response to the increasing global demand for semiconductor components, this work aims to establish a foundation for producing high-performance semiconductors that contribute to the advancement of the state-of-the-art technology.

## FENNEC: Center of Gravity Estimation using Neural Networks for Rotary-Wing Aircraft
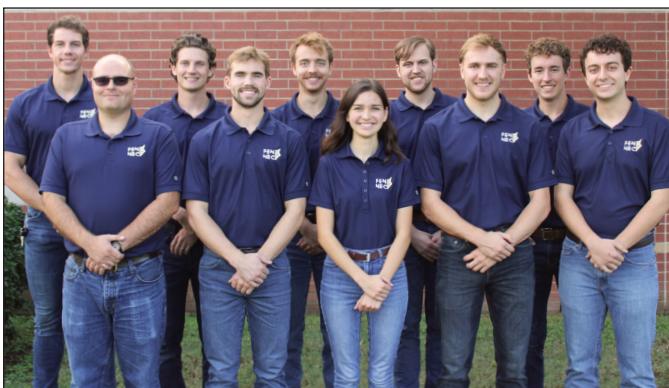
FACULTY ADVISOR: Dr. Andrew Davis

Rotary-wing aircraft would benefit from the ability to accurately and reliably determine the location of the Center of Gravity (CG). Aircraft capability is reduced when a safe control setting or flight envelope is selected to account for the CG uncertainty. This research project will use flight data such as actuator inputs, measured properties, and aircraft response to create a machine learning model to predict real-time CG estimates. Flight tests, experiment design, analytical methods, and machine learning will be combined to answer the posed research questions.

2024 - 2025 Senior Design Projects

LeJAM: The Jubilee Air Mission
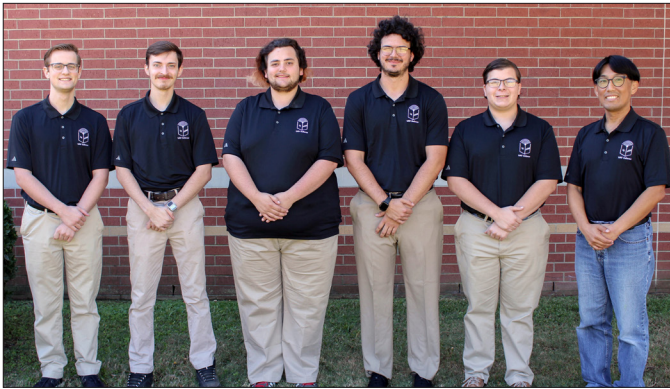
FACULTY ADVISOR: Dr. Hoo Kim

LeTourneau Jubilee Air Mission focuses on delivering a functional UAV platform that is capable of simulating electromagnetic (EM) effects as well as providing insights on the vulnerabilities of modern electronic systems under EM stress. With little research available on the effects of EM emissions and attack drones, the future of drone technology is about to be revolutionized. Targeting flight controller and other electrical systems, LeJAM aims to further enhance the capabilities of attack drones when in contact with advanced EM defenses by enhancing security and operational efficiency.

UAV Defense

PASTEL: Picturesque Art Studio to Elevate LeTourneau

FACULTY ADVISOR: Dr. Hanwan Jiang

Develop a complete design packet for the proposed studio art building on LeTourneau University's campus. All aspects of the building design will be detailed through reports and an engineering drawing set. The tasks include architectural and structural design, site and soil investigation, land development, foundation design, building structural design, cost estimate, construction plan, road design, parking lot design, and connection and detail design. Also, electrical (lighting and power) and mechanical (HVAC, plumbing, and fire protection) systems should be included.

SAE BAJA: Renegade Racing

FACULTY ADVISOR: Prof. Jeff Johnson

Renegade Racing will compete against more than 100 other universities at Baja SAE Arizona in May 2025. The team will design, document, fabricate, and test a single-seat, four-wheel-drive off-road vehicle that meets the stringent SAE specifications. Committed to innovation, they aim to exceed performance limitations of previous versions with a new design. Judges will evaluate the vehicle in areas of design, cost, acceleration, hill-climbing or sled-pulling, maneuverability, suspension, endurance, and the team's ability to attract investment interest for production of their prototype.

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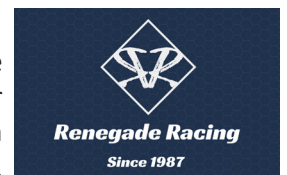
2024 - 2025 Senior Design Projects

LUNAR: LeTourneau University Nexus for Amateur Rocketry

FACULTY ADVISOR: Dr. Chad File

The challenge is to launch a 2-stage high-powered rocket packed with golf balls as the payload for competition in the 2025 Argonia Cup in Kansas. The objective is to design, build, and test a rocket that will carry this payload to the highest altitude possible, up to 40,000 ft, and achieve successful recovery with minimal damage. Ranking is score-based, where the team with the highest score wins. The equation for points relies on altitude, number of golf balls, and impulse of the motors. An avionics bay is required to control the electronics, which calculate altitude, track the rocket, and determine the timing of specific separation events utilizing chemical energetics.
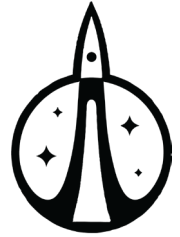
On-Par: Putting Aid Robot

FACULTY ADVISOR: Prof. John Tixier

The goal is to design and develop two golf putting devices targeting aspiring, collegiate, and professional golfers. The office model efficiently captures, stores, and returns both accurate and errant putts while measuring and recording putting accuracy during each session. The outdoor model goes further by analyzing putting green terrain and green speed, providing real-time feedback to help golfers refine their directional compensation skills. Both models enable golfers to track their progress over time. Marketability and commercialization of these two devices will be pursued.

On-Track: LETU Go-Kart Track Development

**FACULTY ADVISOR: Dr. Yunus Salami**

This project will develop two separate go-kart track designs for future construction. A redesign of last year's design will aim to optimize space and improve efficiency of construction. A complementary but comparatively smaller track will be designed for a location closer to campus for accessibility and ease of use. A dedicated go-kart track will provide year-round use for students, staff, and faculty and will attract users from the Longview and greater East Texas community. The design process will integrate principles of sustainable engineering design with other technical aspects like hydrologic, geotechnical, and transportation engineering all in accordance with industry guidelines and the city's unified development code.

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LeTourneau Combat Robotics
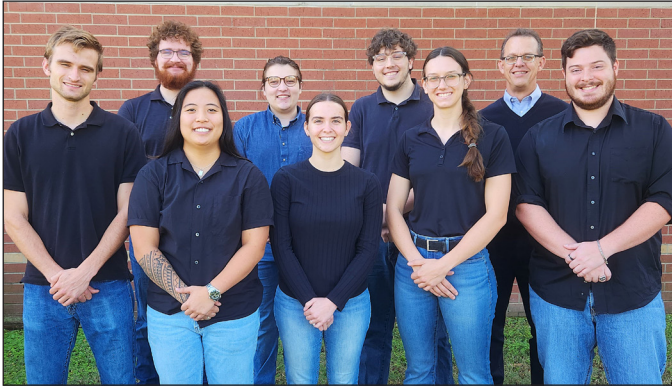
FACULTY ADVISOR: Prof. Norm Reese

An innovative twelve-foot combat robot arena will be designed and manufactured to be portable, easily assembled, and cost-effective. Improvements to a polycarbonate impact-testing system will be made and research conducted to set a standard for arena safety. One-pound and three-pound combat robots will be built to compete in various tournaments. A regional combat robotics competition will be hosted on campus in March.

LETREP25: LeTourneau Rehabilitation Engineering Project 25

FACULTY ADVISOR: Dr. Ko Sasaki

The goal of the project is to develop a wearable sensor system using two inertial measurement units (IMUs) to track a patient's lumbar range of motion (ROM) and accurately collect data at home during activities of daily living. The data taken by the sensors will be integrated into a comprehensive app to be developed for doctors to analyze and improve patient care. Sensors will be tested on healthy patients to be used later to treat lower back pain.

SAUWW: Underwater Wet Welding SAW flux development

FACULTY ADVISOR: Dr. Ezequiel Pessoa

The goal of this project is to develop a submerged arc flux that will work for underwater wet welding to slow down cooling rate, improve weld bead geometry, and increase arc stability. Building upon the previous team's results, different flux compositions and application medias will be tested and recorded using various collection methods. A final flux that meets the project goals most closely will be selected and results will be presented at the Fabtech conference in Sept. 2025.

STARS: Starlink Tracking Antenna Reference System

FACULTY ADVISOR: Dr. Nathan Green

The STARS Team will design, build, and test a system to track Starlink and other similar satellites across the sky and capture their live-sky signals for processing. This project involves collaboration between mechanical and mechatronics robotic design teams, and RF, electrical, and software design teams. Software development will be performed in Python and MATLAB environments. The project will equip students for both industry and academic paths with a particular focus on aerospace, satellite communications, controls, and RF fields.

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