LeTourneau University
ENGINEERING & ENGINEERING TECHNOLOGY

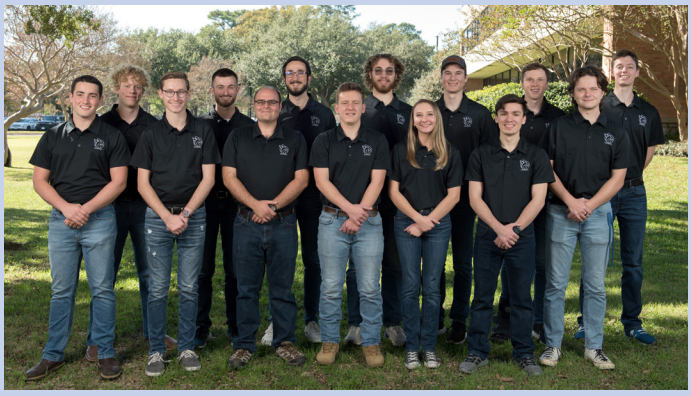
Senior Design Projects
2023 - 2024

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. The purpose of ACME is to expand and improve on our current processes by updating the pump and flow control and nozzle designs for stronger and more detailed prints. The 3D printer footprint will be expanded to have the option to 3D print a concrete canoe for competitive use with pioneering research and testing of waterproof print structures while contributing to the development of the industry.

FENNEC: Modeling of Rotary-Wing Flight Dynamics using Machine Learning



FACULTY ADVISOR: Dr. Andrew Davis

Aerodynamic models for unmanned air systems (UAS) are expensive and require significant development time. As a result limited aerodynamic models often limit UAS usefulness or increase operating risk. This project seeks to utilize machine learning (ML) to generate aerodynamic models for unmanned rotary-wing aircraft to mitigate the need for traditional system identification methods that require large amounts of optimized data to be effective.

Frontier Robotics

FACULTY ADVISOR: Prof. Norm Reese

The Frontier Robotics team will design and build two 15-pound combat robots for competition, build a 12-ft portable combat arena, and conduct polycarbonate impact testing to ensure safety in our arena. The team will host a regional competition at LeTourneau in March and will travel to Kansas City in April to compete in a National Robotics League competition.

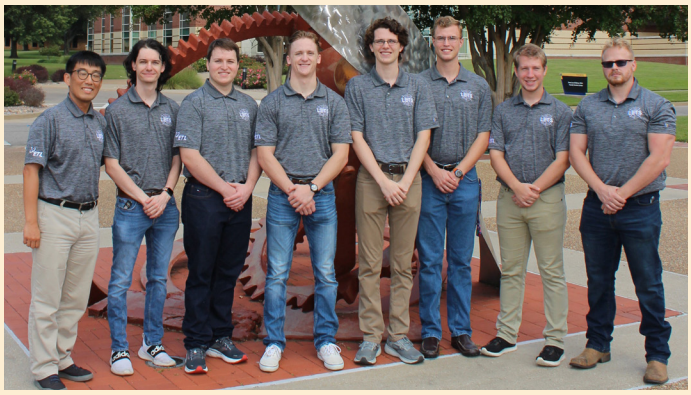
LETREP24: LeTourneau Rehabilitation Engineering Project 2024

FACULTY ADVISOR: Dr. Ko Sasaki

LETREP 24

The LETREP 24 team is developing a new method for measuring the range of motion of the lumbar spine. The method will utilize inertial measurements units (IMUs), which are small wearable sensors with formidable potential to be applied to movement analysis. Additionally, the LETREP 24 team will develop a mechanical system to simulate simplified human lumbar movement to validate the IMUs in comparison to an 11-camera motion capture system.

LETS: LETU-ETL Team Stealth



FACULTY ADVISOR: Dr. Hoo Kim

LETS

LeTourneau ETL Team Stealth will design an enhanced Stealth UAV prototype. RADAR Cross Section (RCS) measures how detectable an object is by RADAR. It is critical to reduce RCS on the battlefield to enlarge the UAV's operational area and enhance its survivability. LETS is studying stealth design parameters by applying ETL's stealth coating to reduce RCS and design a prototype of an enhanced stealth UAV platform. LETS uses the commercial software FEKO for RCS analysis and Virtual Wind Tunnel for aerodynamic design. The designs will be validated in an anechoic chamber and a wind tunnel.

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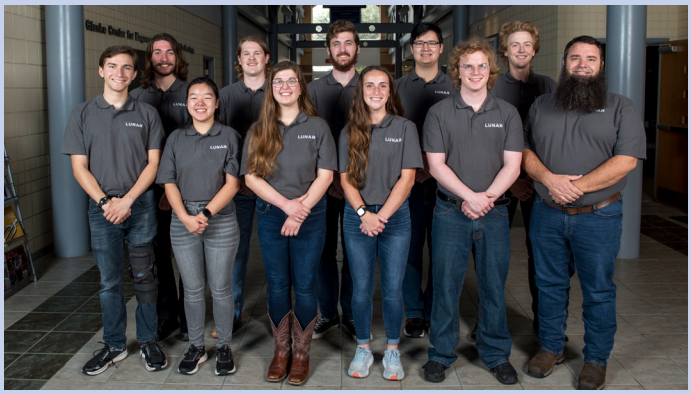
LeTourneau University | the Christian Polytechnic University

LUNAR: LeTourneau University Nexus for Amateur Rocketry

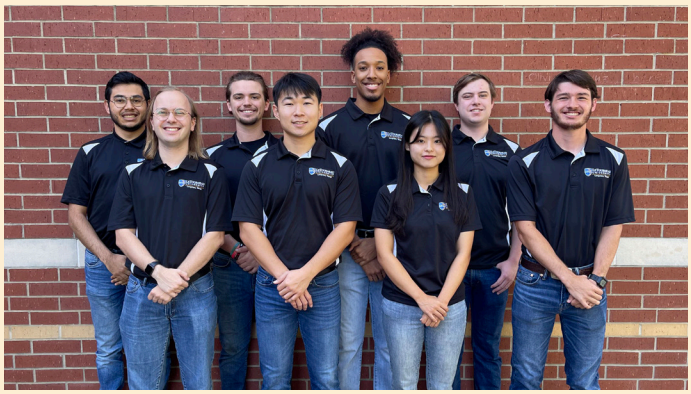


FACULTY ADVISOR: Dr. Chad File

LUNAR

LUNAR will compete in the NASA University Student Launch Initiative competition, in which the challenge is to design, build, and test a high-powered rocket. The payload is a vehicle (a folding quadcopter with model astronauts, called STEMnaunts) to be deployed in air from the rocket after apogee (a targeted altitude no higher than 6000 ft) which lands in a predetermined orientation on the ground. The design requirements and deliverables are modeled after NASA's mission projects and deliverables. Teams are scored by comparing their measured apogee to their prediction one and by safe delivery of the payload.

LUSCE: LeTourneau University Smart Charging Exploration



FACULTY ADVISOR: Dr. Joonwan Kim

Project LUSCE will design and manufacture a portable solar-powered charging system for small electric vehicles to solve today's fixed infrastructure power limitations. The system will power a vehicle via solar energy either straight from on-board solar panels or from the on-board power bank, such that the charging system will stay completely off the grid. Energy from the solar panels and the power bank will be transferred to the electric vehicle according to predefined specifications of the LUSCE charge controller. The charge controller manages the power input and output of the charging station and the battery.

LeTourneau University
Engineering & Engineering Technology

Built by Design.
Dream • Research • Create • Invent • Build

ON-TRACK: LETU Go-Kart Track Development

FACULTY ADVISOR: Dr. Yunus Salami

LeTourneau University hosts several go-kart races each year and uses parts of the roadways around campus for this race, with limited opportunities for practice. A dedicated track designed and built exclusively for this purpose has the potential to attract users from around the Longview and East Texas communities and become available for use year-round, including to students, staff, and faculty. Opening such a go-kart race track to the public could potentially increase revenue for the university. The purpose of this project is to design a go-kart track on University property and build a short section of the track for performance testing, along with a cost-benefit analysis.

R & D: Reconnaissance & Disruption

FACULTY ADVISOR: Dr. Darryl Low

R&D is sponsored by Advanced Microbial Solutions (AMS). Facultative lagoons are the solution for wastewater purification in rural or underfunded areas. A large lakebed is made in the ground, into which pumped wastewater is able to settle out and be purified by injected bacteria. Clean water can then be released back into nature. But over time the waste builds up as sludge, limiting performance of the lagoons. R&D will create two fully automated boats. The smaller boat, Reconnaissance, will map the levels of sludge depth. The larger boat, Disruption will target the sludge buildup so that the bacteria injected by AMS can purify the water more efficiently.

SAE BAJA: Renegade Racing

FACULTY ADVISOR: Prof. Jeff Johnson

Renegade Racing is LeTourneau University's SAE Baja Team. The objective is to design and build a fully functioning, one-passenger Baja vehicle, able to take on rough terrain and meet the many specifications put forth by SAE. The job of the team is not only to build this car, but to engineer, document, and create it in the most cost-effective way possible. The competition includes the 4-hour endurance race, hill climb, and maneuverability tests. The goal this year is to successfully compete in the AE competition held in Williamsport, PA, in May 2024. This will be the first 4WD vehicle for the team, and the first competition in 5 years.

SAUWW: Underwater Wet Welding SAW flux development

FACULTY ADVISOR: Dr. Ezequiel Pessoa

The Underwater Wet Welding (UWW) senior design team is developing a flux for underwater submerged arc welding applications, focusing on increasing arc stability, decreasing cooling rate, and improving weld bead geometry. Flux development will come from literature review, parameter testing without flux, parameter testing with pre-made fluxes, and testing different mediums for containing the flux. Data collection will be applied to determining composition for final flux. Results of this research will be presented on a poster at FABTECH conference in October 2024.

STARS: Starlink Tracking Antenna Reference System

FACULTY ADVISOR: Dr. Nathan Green

Team STARS will design, build, and test a system to track Starlink and other similar satellites through the sky and record their live-sky signals for processing by the RF team. This project will require collaboration of mechanical, controls, RF, and software teams. Software development will be performed in Python and MATLAB environments. The project will equip students for both industry and academic paths with particular focuses in aerospace, satellite communications, and RF fields.

TATO: Vehicle Mobility Assist Device

FACULTY ADVISOR: Dr. Gitogo Churu

Individuals who are wheelchair-bound often have difficulty entering and exiting vehicles. The main goal of the Transition and Transfer Objective (TATO) is to design and build a device that can safely transport a non-walking person into and out of a vehicle. This will be achieved by engineering a hydraulic lift in combination with a wheelchair mounting system that can be easily operated by a caregiver.

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