LeTourneau University

Engineering & Engineering Technology

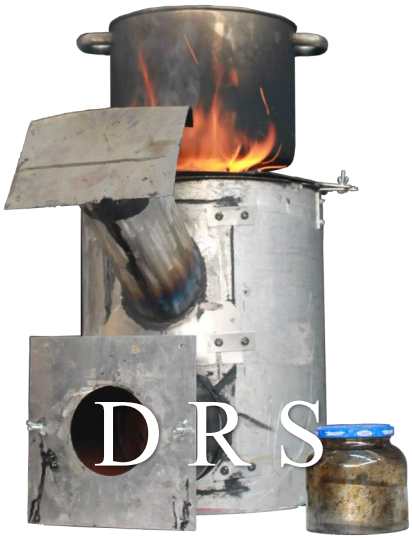
2015-16 Senior Design Projects

At LeTourneau University, we implement engineering design and project-based learning throughout our entire curriculum. LETU engineering students participate during their senior year in a year-long capstone project as part of a multi-disciplinary team that embodies our "learn by doing" philosophy. LETU students complete a wide variety of projects that include collegiate competition, applied research, industry or service-based. Below, you will find descriptions of the senior design projects for the 2015-16 academic year.

The primary goal of the LeTourneau Autonomous Robotics Competition (LARC) senior design team is to design and build a robot to compete in the 2016 IEEE Region 5 Robotics Competition. This year's competition challenges the sensing, navigating, learning and reading capabilities of an autonomous robot. The field is a simple maze. Scoring emphasizes rational search patterns, path learning, reading symbols, and speed. The LARC team will compete against several other schools in IEEE Region 5.

Faculty Director: Dr. Joonwan Kim

Typical Majors/Concentrations: Electrical, Computer and Mechanical Engineering



The Disaster Relief Solutions (DRS): Emergency Energy Team is working to design, build, and test a portable and cost effective stove that is able to meet basic human needs ranging from electricity generation to cooking to heating a room. The stove will use wood fuel to generate thermal energy, which will then be converted into electricity. Essential criteria include the stove being efficient, safe, and reliable.

Faculty Director: Dr. Scott Anson

Typical Majors/Concentrations: Mechanical, Electrical, and Materials Joining Engineering

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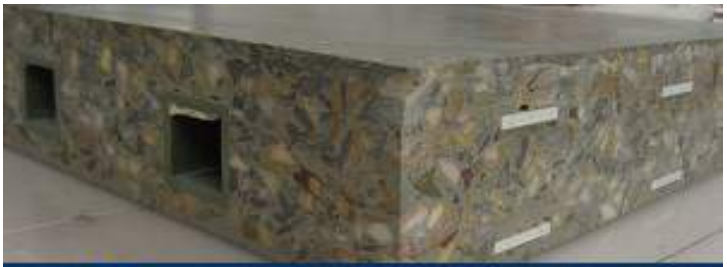
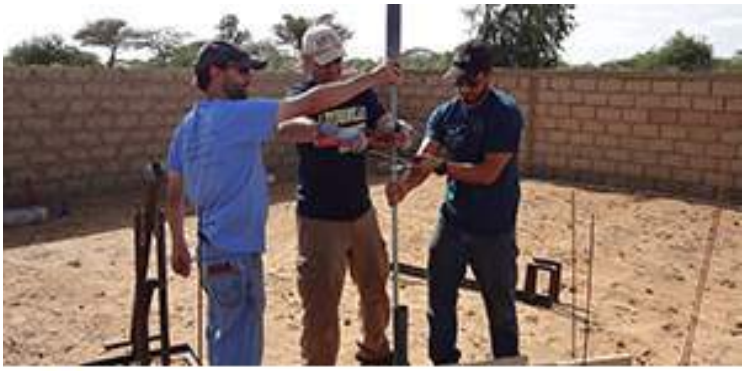


LeTOURNEAU
STRUCTURAL COMPOSITES
Innovation to Build On

The Structural Composites Senior Design project requires students to design a new, lightweight, high-durability deck system for replacement of deteriorated concrete and steel decks on short- to medium-span road bridges. The project includes extensive materials testing to international standards (ASTM, ISO) and design practice according to national bridge design codes

Faculty Director: Dr. Steve Ayers

Typical Majors/Concentrations: Civil, Mechanical and Materials Joining Engineering



ENGINEERED WATER SOLUTIONS

The LETU Engineered Water Solutions (EWS) Senior Design project expands the ongoing development of a human-powered pump and the utilization of water provided by that pump in a developing world setting. EWS has developed a prototype drilling system and prototype pump. The aim of the project is to continue to develop procedures for water well completion and to improve the efficiency and output of the prototype pump. The aim is to deploy improved design solutions in Senegal in May 2016.

Faculty Director: Dr. Steve Ayers

Typical Majors/Concentrations: Civil and Mechanical Engineering

Photonic Biosensor

The LETU Photonics Biosensor Senior Design Team aims to design and build a point-of-care (can be used outside of the doctor's office) biosensor for the early detection of cancer and other chronic diseases. The device must be label-free (no processing of blood before blood is placed in the biosensor), low-cost, highly sensitive, able to detect multiple diseases and user-friendly.

Faculty Director: Dr. Seunghyun Kim

Typical Majors/Concentrations: Electrical, Biomedical and Mechanical Engineering

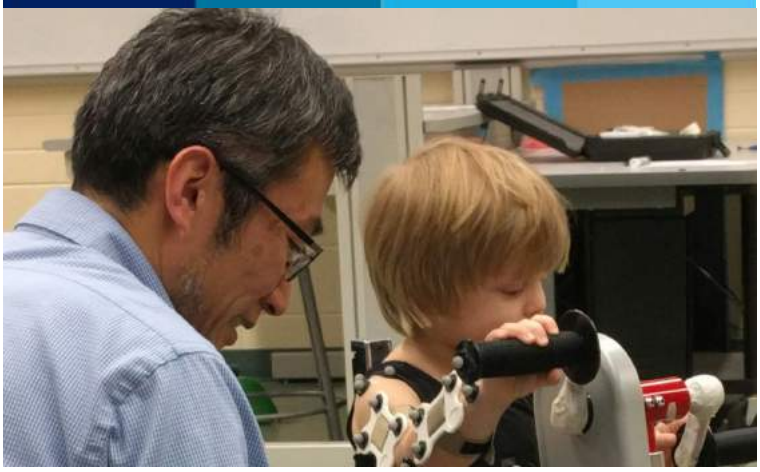
Additive Manufacturing Modeling

The Additive Manufacturing Modeling Team for 2015-2016 is modeling, analyzing, and optimizing mechanical properties of a functionally gradient transition piece from Cr-Mo steel to Inconel 625 being created by both solid state and fusion teams. Such properties include thermal cycling, thermal stresses, thermal expansion, and residual stresses. This piece will make welding between two dissimilar metals much easier by changing the different metal composition between the desired dissimilar metals. This technology has applications in fields where dissimilar metals are used such as power generation, defense, and aerospace.

Faculty Director: Dr. Yoni Adonyi

Typical Majors/Concentrations: Materials Joining and Materials Joining Technology Engineering

SMART



The Specialized Mobilization And Rehabilitation Therapy (SMART) project will consist of two major components: kinematic analysis of the limbs in children with mobility impairment to quantify the effectiveness of physical therapy using therapeutic tricycles, and development of a multi-axis load-cell system for the future kinetic analysis of those children. The load-cell will be designed such that the force transducer can be used to measure not only forces applied on the therapeutic tricycles by children, but also forces exerted on similar mobility-improvement devices such as wheelchairs.

Faculty Director: Dr. Ko Sasaki

Typical Majors/Concentrations: Biomedical, Electrical, Mechanical Engineering

Additive Manufacturing Fusion Processes

The Additive Manufacturing Fusion Processes Senior Design Team is working to model, make, and test a functionally gradient transition piece for joining Cr-Mo steel to nickel-based alloys. The transition piece is needed due to the different coefficients of thermal expansion and the thermal loading that joints can experience in certain applications. Successful completion of the project will lay the groundwork for other currently difficult joints between dissimilar metals.

Faculty Director: Dr. Yoni Adonyi

Typical Majors/Concentrations: Materials Joining and Materials Joining Technology Engineering

VACS

The goal of the Versatile ADS-B Communications System(VACS) project is to design, build and test a prototype of a compact and versatile automatic dependent surveillance – broadcast (ADS-B) communication card sponsored by Rockwell Collins Inc.

Faculty Director: Dr. Joonwan Kim

Typical Majors/ Concentrations: Electrical, Computer and Electrical Technology Engineering

FWR

Frack Water Reclamation

LeTourneau University's Frack Water Reclamation team is exploring options for both treating water contaminated by hydraulic fracturing (“fracking”) to safe levels while developing a sensor to quickly measure the H_2S concentrations to ensure proper treatment. This research could increase safety of fracking operations and potentially lead to opportunities to safely reuse and reclaim fracking water, which could be economical for the oil industry and decrease the environmental impact. The goal of the team is to design a system at an industrial scale which measures the concentration of H_2S in the water and uses this measurement to adjust a treatment system to efficiently treat the water to safe levels.

Faculty Director: Dr. Darryl Low

Typical Majors/Concentrations: Civil, Electrical, and Mechanical Engineering

VERT-Salt

Vortical Energy Recovery Turbine

The VERT-Salt senior design team is designing, building, and testing a water purification system that can pump and filter water using only renewable energy. The goal of the VERT-Salt system is to provide a stand-alone system that can pump water from a variety of sources: fresh water, brackish water, and salt water. The water will then be filtered using reverse osmosis and a series of purification filters, depending on the source. In many rural villages, water collection can take up to six hours daily. The VERT-Salt system will permit water to be collected locally, giving rural people more time to earn a living and giving children better educational opportunities.

Faculty Director: Dr. Jesse French

Typical Majors/Concentrations: Mechanical, Electrical, Electrical Technology, Mechanical Technology Engineering

Disproportionate Collapse Resistance

The current goal of the Disproportionate Collapse Resistance (DCP) team is to develop new gravity connections and enhancements (for existing connections), with the aim of increasing the tensile load capacity, thereby minimizing the effects of a column loss scenario and preventing disproportionate collapse. Research is conducted by physical testing of half-scale connection assemblies and by finite element analysis. The objectives for the 2015-2016 year are to test three new connections and three new enhancements capable of resisting the extreme demands under column loss scenarios, and to investigate the contribution of a reinforced concrete slab in resisting the loads

Faculty Director: Dr. Gustavo Cortes

Typical Majors/Concentrations: Civil, Mechanical, Mechanical Technology, Materials Joining and Materials Joining Technology Engineering

E.A.C.S.

The Goal: The goal of the Electronic Access Computer Station (EACS) team is to design an electronic control system that will automate a computer station's vertical door system. This system will provide hands-free access to computers housed inside of a wall-mounted computer station. The project is sponsored by a local manufacturing company, the CCI Group.

Faculty Director: Dr. Joonwan Kim

Typical Majors/Concentrations: Electrical, Computer and Mechanical Engineering

Frontier Wheelchairs

The Frontier Wheelchairs team is developing wheelchair test equipment for manufacturers so that they can build better chairs for the developing world. Students are designing one test machine to measure wheel rolling resistance and two machines that expose wheelchairs to bumps and drops to determine wheelchair durability. The team plans to travel to South Africa this summer to build these test machines for a manufacturer there.

Faculty Director: Norman Reese

Typical Majors/Concentrations: Mechanical and Mechanical Technology Engineering

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