LETU Senior Design Projects 2017-18

KIM, JOONWAN

Wireless Animal Scale Platform (WASP)

Project WASP is an agricultural technical application requiring the design of a modern and portable scale system for the weighing and maintenance of livestock or small animal projects. The project components require the design of a portable, lightweight and durable weighing platform, firmware for an existing embedded PCB (Bluetooth LE) design using the C programming language and development of a cell phone app for Android and IOS. The app will serve as a display and interactive control for scale operation. This project will be guided by a team from StephTech LLC with regular team meetings to keep the project on track.

Applicable Majors: Comp E, EE, ME

Aircraft Sense and Avoid Flight Electronics (AirSAFE)

The goal of the LETU AirSAFE Team is to design and prototype a card or system of cards that is small and light-weight enough to be mounted on an unmanned aerial vehicle (UAV), and that is capable of the air collision avoidance systems for most drones on the market. When the device receives ADS-B signals from a certain radius of nearby aircraft and airports, it will automatically navigate to a safer location by notifying the ground station or by flying automatically. This will greatly improve the ability of UAVs to avoid the vicinity of commercial aircraft and other ADS-B equipped vehicles, significantly decreasing the likelihood of mid-air collisions.

Applicable Majors: CE, EE

DEMKO, JONATHAN

Low Cost Pipe Thermal Insulation Test – Below Ambient Temperatures

A low cost device for measuring the thermal conductivity of pipe geometry insulation is proposed. Some initial work is based on a 2 inch nominal diameter pipe with1 inch thick insulation. This is in response to ASTM WK58244-1 which concerns development of a new standard — Standard Test Method for Steady-State Heat Transmission through Pipe Insulation Operating at Below-Ambient Temperatures. The design is based on a heated inner pipe that is covered by insulation and immersed in a bath that can be at different temperatures; (a) room temperature (290K-300K), ice bath (273 K), and liquid nitrogen (80 K). This device would provide data for most commercial low temperature systems such as LNG which operates around 112 K.

Applicable Majors: EE, ME, MJE, EET, MJT

LOW, DARRYL

Measurement and Removal of Sulfides in Fracking Wastewater

Hydrogen sulfide (H_2S) is a contaminant frequently found in the flowback water during the production phase of an oil or gas well. H_2S is particularly challenging contaminant due to the difficulty to measure it the water phase and its potential to volatilize to the gas phase where it can be lethal. Flowback water containing H_2S is typically disposed of by deep well injection via a disposal well rather than treating for reuse, resulting in significant water loss. This senior design project will be the culmination of three previous years of work in which a treatment reactor was built that successfully reduced H_2S concentration of flowback water by >80% as well as retrofitting an H_2S gas sensor to measure H_2S in the water phase. This year's team will tasked with completing the project by testing the previous year's proposed systems and identifying areas of improvement. Subsequently, the team will design, construct, and test the updated system of their own design with the help of an industrial mentor. Testing will be done using flowback water from a producing well.

Applicable Majors: CVE, EE, ME

ANSON, SCOTT

Disaster Relief Solutions: Emergency Energy

A mapping of Maslov's hierarchy of needs to post disaster conditions, results in recognition of the urgent need for food, water, warmth, energy, companionship/social connection, and esteem in a time when prior sources are fractured. The team conducts heuristic research on rocket stove technology to efficiently produce energy. Fuller design, build and testing will be done on rocket stove technology to quantify the amount and efficiency of energy production and capture. Subsequently, design, build and test will be completed on new/improved energy production and harvesting methods.

Applicable Majors: EE, EET, ME, MJE

DITTENBER, DAVID

SafeHome

Samaritan's Purse partners with John Brown University to co-sponsor and support a yearly disaster shelter design competition, with the hope that excellent entries will lead to shelter designs that SP can implement in disaster situations. Last year, the SafeHome team was able to enter two different shelter designs in the competition. This year, the SafeHome team will have two components: (1) One sub-group of the SafeHome team will provide a new entry in the 2018 JBU/SP disaster shelter design competition. Design considerations for the competition include dimensional requirements, wind and seismic resistance, living comfort, durability, cost, weight, transportability, manufacturability, and cultural considerations. (2) A second sub-group of the team will be working in a longer-term disaster shelter research effort. This partially-funded work will involve the design and construction of a new major testing fixture and the design, manufacturing, and evaluation of full-size modular wall panel designs. Working on this project will require a lot of creativity, teamwork, and diligence. Applicable Majors: CVE, ME, MET

REESE, NORMAN

Frontier Wheelchairs

With the goal of making wheelchairs strong and inexpensive, sometimes ease-of-use has been compromised in developing countries. One part of making chairs easier to use is utilizing components that roll easier. Previous senior teams have built a rolling resistance measuring machine for measuring rolling resistance of wheelchair large wheels. This year the project will be to use that machine to characterize wheels for manufacturers from around the world. The design goal will be to adapt the machine to also measure rolling resistance of casters and use multiple measuring instruments. The team's work is anticipated to result in a nationally recognized journal article or conference presentation.

Applicable Majors: ME, EET, MET

DOWNING, WES

SAE Mini Baja Competition

Design SAE approved mini baja car to submit for design competion in static and dynamic events.

Applicable Majors: EE, EET, ME, MJE, MJT, MET

LICHTENBERG, BYRON

Cubesat Payload Development

This project is to design, build, and test a payload for a cubesat type nano-satellite. The overall concept of the project will be as follows. Year 1- design, build, and test a payload for a 1U (10 cm cubed) cubesat bus. As part of this project, mechanical, electrical, and data interfaces that simulate a flight cubesat will be constructed. There are several different categories of payloads including scientific research and technology development; the team will decide upon a payload. Discussions are currently ongoing with Orbital ATK (formerly Orbital Sciences Group) for project sponsorship (both financially and technically). Orbital ATK is a multi-billion-dollar spacecraft and defense contractor, with significant history and expertise in private spaceflight.

Applicable Majors: CSE, EE, ME, EET, ETAS, MTAS

SASAKI, KO

Stance-control Knee and Articulating Foot Prostheses for Transfemoral Amputees

This project aims to design, fabricate and test a "stance-control" prosthetic knee for transfemoral (above-knee) amputees. Transfemoral amputees often sustain falling and consequent injuries because the prosthetic knee tends to "buckle" during the weight-bearing phase of gait, especially when the knee is in a flexed position. Therefore, the amputees need to make sure that their prosthetic knee is fully extended during weight-bearing to avoid knee buckling. This requires very awkward motion and high energy

consumption in some movement (e.g., stepping up, walking on uneven terrains). The mechanical knee joint to be developed in this project aims to prevent knee buckling even if the knee is in a flexed position but allow knee extension. Depending on the number and the strength of team members, an additional project is planned to design and test a new prosthetic foot that may reduce unwanted mechanical loading on the "intact" leg of the amputees. (Unilateral transfemoral amputees rely on and use more their intact leg, which often leads to over-use injuries in the intact leg.)

Applicable Majors: BME, ME

TIXIER, JOHN

Air Conditioning Lab Modernization Project

In the Technology Measurements Lab, there is a Scott Engineering A/C Trainer that either needs to be fixed or tossed. Choosing to fix it, this AC Modernization project will provide the Senior Design Team with the opportunity to fully understand the theory and practice of the A/C cycle and how it applies to this specific unit. They will design and implement an upgrade to the existing system, including selection of key replacement components (changing out the old R-12 components for R-134) and instrumentation. A design (including draft P&ID, LabView controls and data collection, and draft operating manual), detailed bill of materials and procurement budget should be produced in the first semester. During the second semester, the students will finalize the design, procure components and materials, assemble the mechanical system, complete programing of the instrumentation and control system, and – in addition to the operating manual – prepare at least one lab module to be used in the Tech Measurements Lab and equivalent ME Lab. The students should include some innovative features above and beyond what may be available in an "off the shelf" commercial system. Upon completion, the students will fully understand various HVAC cycles and provide SEET with a state-of-the-art laboratory AC trainer unit with lab modules for future students in class.

Applicable Majors: ME, EET, MET, MJT

LEIFFER, PAUL

LeTourneau Autonomous Robotics Competition (LARC)

The primary goal of the LARC senior design team is to design and build a robot to compete in the 2018 IEEE Region 5 Robotics Competition at Austin, TX. This year's competition challenges the sensing, navigating, learning and reading capabilities of an autonomous robot. The LARC team will compete against 15 other schools in IEEE Region 5 such as the University of New Orleans, Texas A & M, LSU and many others.

Applicable Majors: CE, EE, ME, EET

GREEN, NATHAN

LeTourneau Advanced Model Predictive (LAMP)

The Aircraft Carrier Deck Motion Compensation project sets out to develop a hardware-in-the-loop (HITL) simulation test of a real-time implementation of an advanced flight control algorithm called Model Predictive Deck Motion Compensation. The LAMP team will join a leading industry team of electrical, aerospace, and software engineers to develop and demonstrate new algorithms to autonomously land large unmanned air vehicles on aircraft carriers in challenging ship motion conditions. Gain experience in Agile software development methodologies while working on cutting edge controls research.

Applicable Majors: Comp E, EE, ME

BAUMER, RICHARD

Impact of Multi-pass Welding Parameters on Microstructural Stability and Weld Performance in Super Duplex Stainless Steel

Successful construction of oil and gas off-shore platforms and petrochemical processing equipment requires a combination of strength and excellent corrosion resistance. Super duplex stainless steels have been developed precisely for these applications. However, welding disrupts the internal microstructure of these alloys and can lead to component failures. The goal of this project is to identify welding process parameters that yield acceptable performance in multi-pass welds gas tungsten arc welds of 2507 (UNS S32750) super duplex stainless steels, including:

1. Develop tests and measure corrosion resistance and toughness in multi-pass welds
2. Correlate weld performance with multi-pass weld microstructure
3. Measure weld thermal cycles and build FEA heat flow models.
4. Perform single pass welds and use Gleeble® 1500 thermomechanical simulator to simulate weld heating/cooling cycles and reproduce root pass microstructures
5. Validate proposed process parameters via manual GTAW welds under field conditions

Applicable Majors: MJE, MJT