Senior Design Day

College of Engineering
University of North Texas

April 25, 2014
UNT Discovery Park

1

A green light to greatness.®

COLLEGE OF
ENGINEERING ∥ UNT

Program

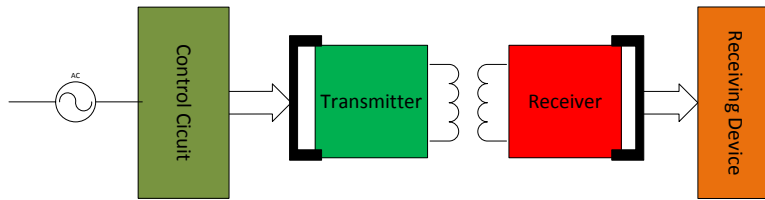Poster Presentations   9 AM- 11 AM

Discovery Park Foyer

Project presentations   11:30 AM- 5 PM

Electrical Engineering Technology

Advanced Inductive Charging Platform (AIG)


Team Members:

Aneel Devaraju
Jacob Fullerton

The Advanced Inductive Charging (AIG) Platform is a low-cost wireless charging base targeted towards untethered devices such as mobile phones, portable game platforms and tablet PCs. A transmitter receives mains power, transforms and rectifies it and uses a microcontroller to modulate it into a suitable format for wireless transmission via a large coil. Different modulation schemes will be investigated as part of the project to ensure maximum transfer of energy. Another large coil at the receiver end couples the power inductively and uses it to charge a Lithium-ion battery pack attached to the portable device. A visual indicator guides the proper placement of the receiver near the transmitter to achieve optimal coupling between the coils. Different visual indicators such as Light-Emitting Diodes (LEDs), LED bars or Liquid Crystal Displays (LCDs) will be considered. Custom printed-circuit boards (PCBs) will be designed for the transmitter and receiver control circuits. A sample application, in the form of a portable game, will be used to demonstrate the functionality and effectiveness of the design.

Wireless Sensor Network for Structural Integrity Monitor Systems (SIMS)

Team Members:

Clifton Ellis
Phillip Holle

A low-power, low-price wireless sensor measuring 3-axis acceleration will be designed and manufactured using inexpensive, readily available commercial components. A number of these sensors will be deployed in a Wireless Sensor Network (WSN) using the predominant industry protocol, Zigbee. The sensor will be deployed on buildings or structures and wirelessly communicate time-stamped, synchronized acceleration data to a central station which
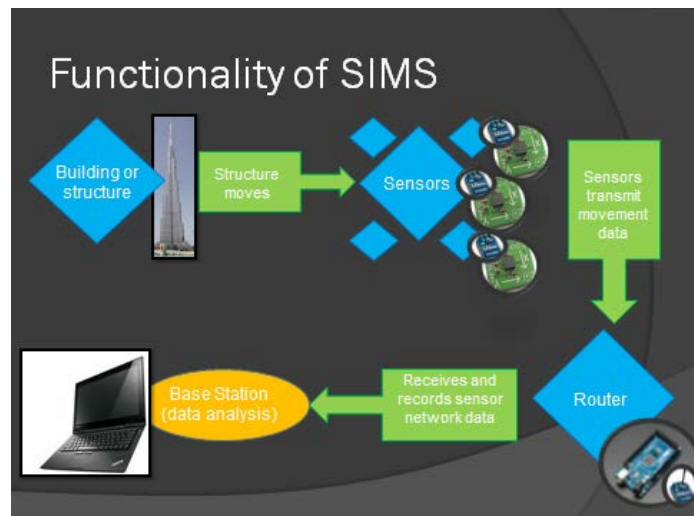
will collect the information for post-processing. This data of type will be useful for analyzing vibrational modes of large structures during times of building stress, such as crowds moving in unison during a football game, or rush-hour traffic on a bridge. The functionality of the WSN will be tested at the UNT Apogee Stadium in a collaborative effort between the Electrical Engineering Technology and Construction Engineering Technology programs at UNT. The platform, associated printed circuit board (PCB) designs and all controlling software will be made freely available to other educational institutions. This project is partially funded by a National Science Foundation grant.
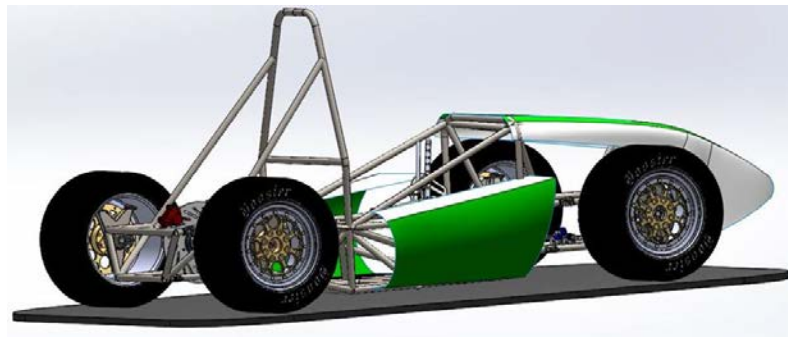
Mechanical and Energy Engineering

SAE Formula Student Powertrain Team, Mean Green Racing 2014
Department: Mechanical and Energy Engineering
Team Members:
James Bailiff
Zach Denney
Mark Goolsbay
Reed Greenwood
Sean Surratt

The 2014 Powertrain Team is a group of 5 students responsible for designing and implementing all of the systems related to motive and electrical power for the Formula SAE race car that will be taken to competition in June of 2014. Per competition rules, students are required to develop a powertrain package based around a 4-stroke internal combustion engine displacing less than 610 cubic centimeters and are required to utilize a 19 millimeter air inlet restrictor. Design challenges include minimizing mass wherever possible, maximizing power output and efficiency within the constraints set forth by the competition rules, controlling costs, and ensuring that the powertrain is reliable and responsive. Team members will use a production motorcycle engine as a basis and will redesign both internal and external components to optimize performance. Assemblies that team members will be responsible for include the throttle body, restrictor assembly, intake manifold, engine, fuel system, chassis electrical system, exhaust system, cooling system, and engine control unit. Team members will use a diverse array of skills and software tools to quantify the effects of heat transfer, acoustics, material properties, fluid dynamics, vibrations, circuit analysis, and control systems. All designs will be tested and verified, revised if necessary, then put to the ultimate test at the 2014 SAE Formula Student Competition in Lincoln, Nebraska where they will face off against student teams from around the world.

First Response Housing
Department: Mechanical and Energy Engineering

Team Members:
Curran Salrin
Garrett McGee
Matthew Scott

The goal for this project is to apply the use of bio-renewable resources to the already existing design of a standard Structural Insulated Panel. A Structural Insulated Panel, or SIP, is a pre-fabricated, sandwich design wall that is constructed off site and sent ready to assemble to your desired location. The motivation for this project is to create a low cost, on site solution using bio-renewable resources such as sugar cane and cotton that are commonly found in most parts of the world. The inner and outer hard surfaces, called sheathing, will be constructed from cotton fibers mixed with a bio-degradable epoxy resin in a process much like the way fiberglass products are constructed. Between the inner and outer sheathing will be 4-6 inches of spray foam insulation made from a sucrose (sugar cane) base solution instead of the standard petroleum based foam used today. Applications for this product are aimed at providing semi-permanent disaster relief housing for areas across the globe that have been subject to disasters such as hurricanes, floods, fires, earthquakes etc., while minimizing its carbon footprint on the environment. These SIPs will allow people to construct stable housing units in a matter of hours at their desired site with a low cost, eco-friendly impact.
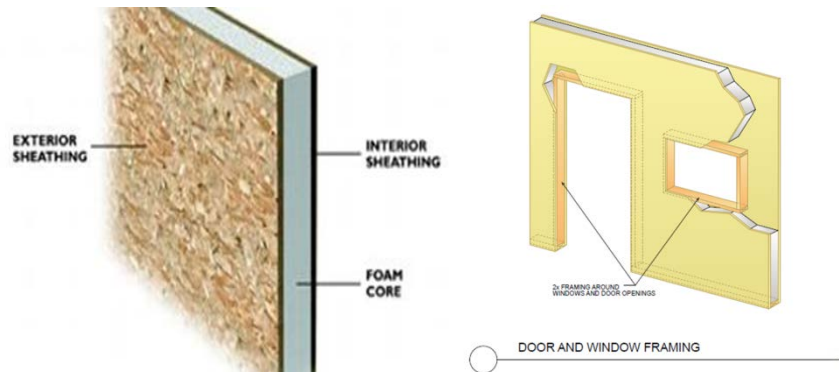
Wind Tunnel Test Bed for Multiple Types of AC Unit Testing
Sponsor: Lennox
Department: Mechanical and Energy Engineering

Team Members:
Alejandro Bartolini
Alex Igwenagu
Chidi Okparaojiako
Rahul Kaila
Rasheed Bishi

The wind tunnel unit, which is being modified, would be able to serve as a platform for multiple tests. The initial proposals were oriented to AC units testing, but the versatility and capability of the equipment were enough to open the opportunity for different tests.

Once studied the equipment, the available resources, and time, a number of modifications were planned and calculated. The main purpose for which this wind tunnel was used by Lennox was to create a static pressure on a chamber to which a complete AC unit would be plugged in, in order to create a fan-coil and the efficiency test.

The expectative are to create a wind mill test, aerodynamic test, and different tests for different AC units like heat exchangers and radiators. The main idea is to use a blower to generate an air current and study how it flows through different bodies and how it affects the heat exchange on a different AC unit. The second test consists on using the air flow to increase the pressure in a chamber, and use it to test the efficiency of the AC unit when the air is flowing through the unit driven by the pressure difference.

Automated Bag Fill Tester
Sponsor: Frito Lay
Department: Mechanical and Energy Engineering
**Team Members:**
Megan Brown
Nick Poulides
Jake Hagood
Tim Kim
Brad Quick

The new Frito Lay automated bag fill tester has been designed by our team with input from the Frito Lay managerial team and lab technician team. The tester will determine the correct bag size for each product in the Frito Lay line. The tester will replace the current bag sizing apparatus and better simulate the actual conditions on the production lines. The tester will be a centerpiece for the new state of the art showcase testing lab that is currently being designed and built at the Frito Lay Research and Design facility.
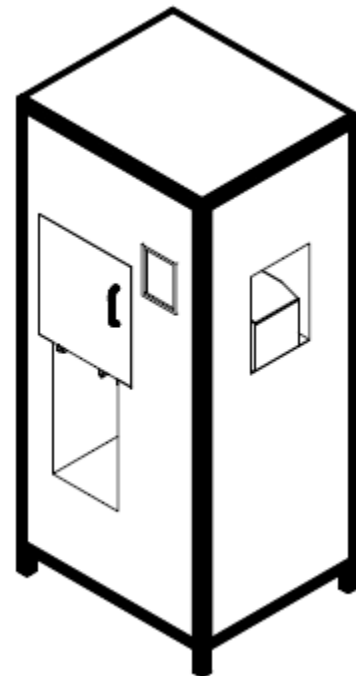
The tester will automate the entire process for the lab technicians and allow them to use a digital camera integrated into the design to archive the bag sizing information. Users will operate the tester with a touch screen controller mounted to the face of the machine. The new tester will have clear surface panels with LED lighting to allow users and guests of the Frito Lay R&D facility to view the inner workings of the machine. The design will be a stainless steel framed enclosed machine with stainless steel internal structure.

Porous Elastomer for Low Rolling Resistance
Sponsor: University of North Texas
Department: Mechanical and Energy Engineering

Team Members:
Alan Sanoja
Brett Gatlin
Oluwatele Folorunso

Purpose of this project is the design, manufacture, and analysis of porous elastomers with low rolling resistance for the use in tires. This would be done by creating 1"x1"x1" coupon samples of selected porous elastomers using a 3D Printer and subsequently analyzing the hysteretic curves of the various samples using a Finite Element Analysis software and an MTS testing machine. Success in achieving lower rolling lower rolling resistance would result in higher energy efficiency for vehicle tires.
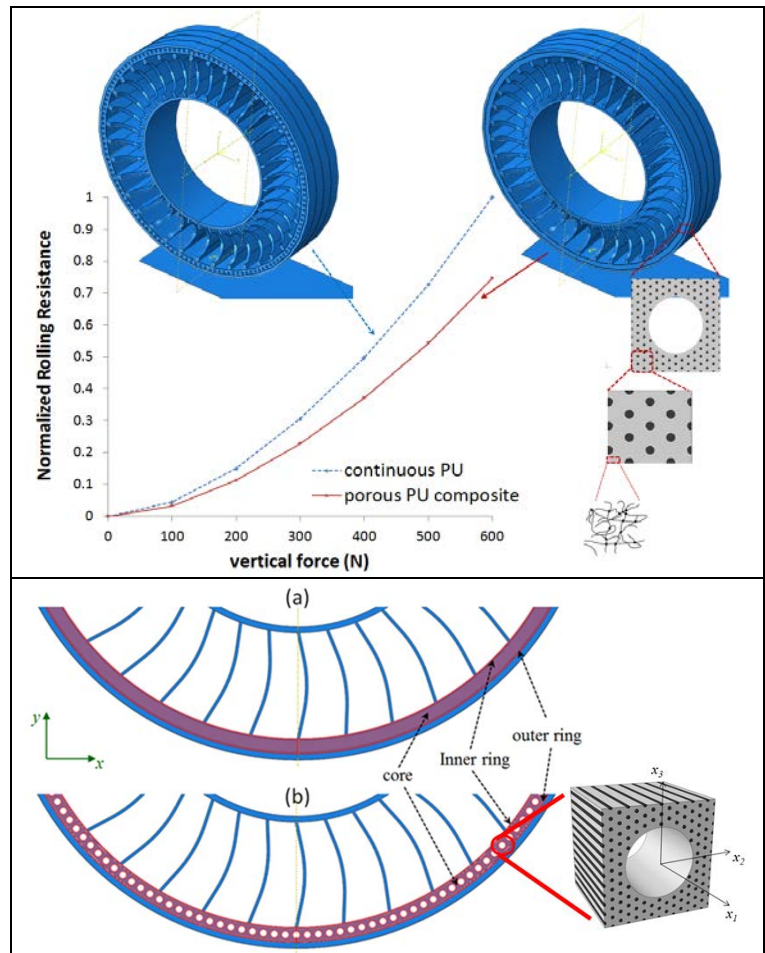
Sci-Tech Green Energy
Sponsor: Sci-Tech Discovery Center in Frisco, TX
Department: Mechanical and Energy Engineering

Team Members:
Mitchell Mulholland
Curtis Knaitt
Sung Song

The Sci-Tech Green Energy team is working to teach children how green energy works. The Discovery Center has multiple exhibits that children can interact with to learn about science. Our goal is for the children to both learn and have fun with our project.
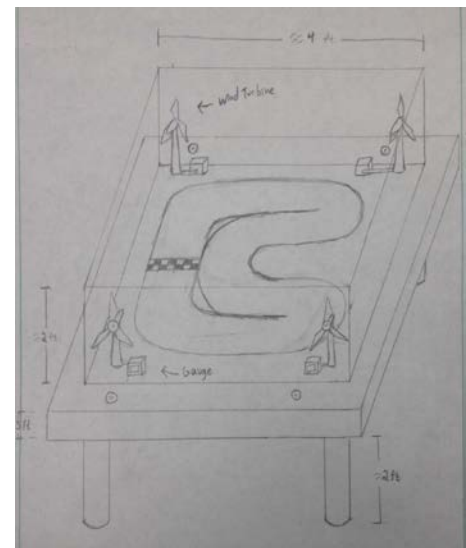
Above is a sketch of our concept design. It has an air pump, wind turbine, and multimeter located at each corner. The children will use the air pumps to spin the wind turbines, which will give them a voltage reading on the multimeters. The air pumps will also be on a pivot so the children can see how the voltage will drop in relation to wind direction. When spinning, the turbines will flip a switch to have a battery power the slot cars on the racetrack. The battery will be hooked up to a solar panel that already exists at the Discovery Center. This will allow our project to operate completely from green energy.

For the part that relates to Mechanical and Energy Engineering, we will be building our own wind turbines and testing multiple designs in a wind tunnel. This will help us determine the most optimal design for our project.

Thermal Energy Storage Device for Controlled Charging and Discharging Using a Concentrated Solar Source
Sponsor: Dr. Yong Tao
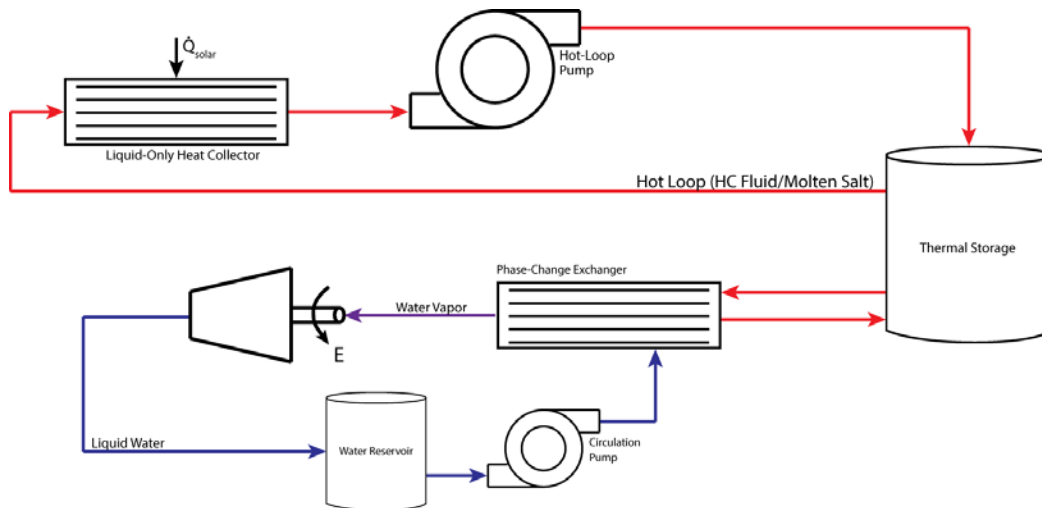**Department:**   Mechanical and Energy Engineering

<u>**Team Members:**</u>
Thomas Ales
David Heydrick
Matthew Gonzalez
Daniel Koza

The "Thermal Energy Storage Device for Controlled Charging and Discharging using a Concentrated Solar Source" group is using a dual loop system to capture, store and use solar thermal energy from a collector to generate electricity. Pulse energy will provide the reflector dish and CPV unit, and the group will accomplish its goals by capturing and making use of the waste heat from the CPV. A "hot-loop" will circulate a working fluid (Paratherm HR) and carry thermal energy from the collector target to a storage medium (concrete) within the single-tank thermal energy storage reservoir. A "cold-loop" (using water as the working fluid) will use the stored heat within the storage tank to vaporize the water and run a steam turbine, therefore producing usable electricity – ideally 1,000-2,000kWh per month.

Perpetual HVAC Retro-commissioning Process

Department: Mechanical and Energy Engineering

Team Members:
Brad Moore
Donald Juarez

This design project is to develop a process for perpetually retro-commissioning HVAC systems in buildings by interacting with the building automation system and acquiring data from existing HVAC instrumentation to identify inefficiencies and provide automatic fault detection and diagnostics for the building operator. A rules-based approach to applying real time fault detection and diagnostics from the building's data will yield actionable information to the building operators in their goal of minimizing HVAC energy consumption. We will collect many months' worth of data and implement this process at Arkansas State University campus in Heber Springs, Arkansas. Using measurement and verification data acquisition software, we will be able to connect to the building's direct digital control system in order to view data inside each of the controllers within the system. Each controller is connected to a device in the HVAC system containing several points. We can use the values of these points to establish a filter criterion in order to configure reports containing only relevant information. By establishing an algorithm for applying different filter criteria based on certain device profiles, we can automate this process in order to retro-commission the building in real time and provide automatic fault detection in an ongoing manner.

Klosky (Split-Hopkinson) Tension Bar
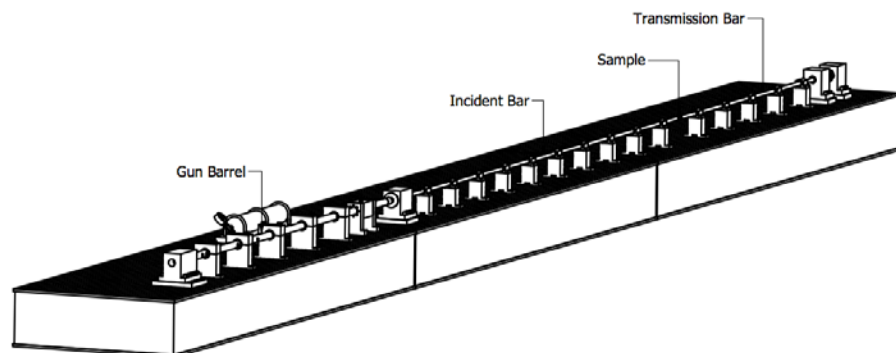
Sponsor: Dr.Xu Nie
Department: Mechanical and Energy Engineering

Team Members:
Colin Loeffler
Tray Kidwell
Chuck Mathes
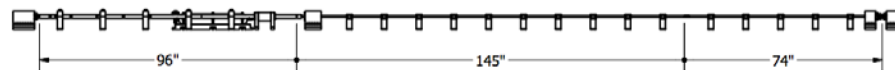
Our objective is to design and build a device to characterize materials or create stress-strain curves for materials under tensile-impact loading conditions, using the Klosky (Split-Hopkinson) Bar Technique (SHTB). This device uses a pressurized-air cannon to generate a Tensile-Stress wave, which propagates down a long, steel, "incident" bar, through a material sample, and then down a "transmission" Bar. The Tensile stress wave is measured by strain gauges attached to the incident and transmission bars, before and after it passes through

the sample. From this data, which is recorded by a high resolution oscilloscope, a stress-strain curve of the material under Tensile Impact-Loading can be created. Our SHTB has a new momentum trapping technique to ensure single loading on samples, and a Laser Displacment-Measurment technique to improve the accuracy of strain data. This SHTB will be utilized by Dr. Nie and his research assistants to characterize materials under impact loading conditions.

Hydrogen Turbine Project
Department: Mechanical and Energy Engineering

<u>**Team Members:**</u>
Daniel Drake
Brandon Smith
Michael O'Brien
Lee Claunch
Christopher Sisneros

The goal of our project is to reverse engineer a kerosene micro turbine to be fueled by hydrogen utilizing a rotating combustor for improving the efficiency and power output. This group plans to accomplish this by developing its knowledge of micro turbines while experimenting with different combustion chamber designs and gaseous fuel injection methods. We are going to try to efficiently burn hydrogen in an inefficient turbine. Hydrogen being a much cleaner and more energy dense fuel source than fossil fuels would be a breakthrough for alternatively powered motors. The fuel injector assembly will consist of a stationary design and a rotating attachment for experimentation. The rotational design will be used to investigate if there is an improvement on the flame profile of the hydrogen burn. We want to accomplish an even flame distribution and eliminate any cold spots in the combustion chamber this will reduce the overall NO_x emissions produced by the turbine. Doing this will require redesigning of the combustion chamber to account for the more concentrated flame distribution, allow the rotational design to spin, and regulate temperature from the much hotter hydrogen flame. We will be comparing our designs to a typical kerosene turbine to prove a 20% efficiency increase and lower emissions.

Polymer Foaming Group
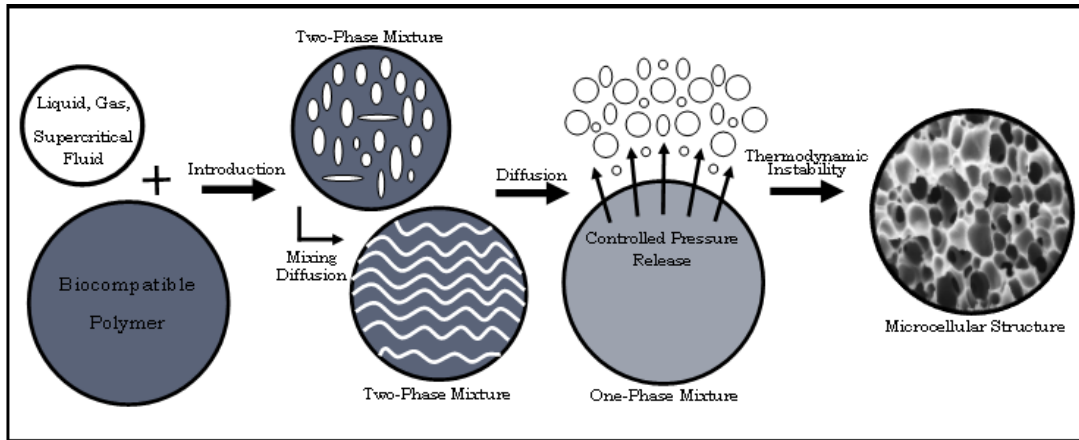**Sponsors:** UNT College of Engineering, NSF Grant
Department: Mechanical and Energy Engineering

<u>**Team Members:**</u>
Mitchell Tardif
Nathan Warner
Erin Wood

The project objective is to develop a processing system that creates foamed fibers. These fibers can be used for cellular reconstruction, drug delivery, and various other applications. The fibers are foamed by introducing a supercritical fluid into a biocompatible polymer. Supercritical describes a state in which a fluid is held at or above its critical temperature and pressure. In this state, the fluid takes on both gaseous and liquid properties. This two-phase mixture becomes a single phase solution due to diffusion of the supercritical fluid into the polymer. The fluid is then removed via an induced thermodynamic instability resulting in a foamed fiber.

An automated, temperature controlled pressure vessel is used to achieve this process. The machine will allow an operator to control a sealed chamber through a touchscreen interface. Functions include temperature and pressure regulation, fluid heating and pumping, as well as timing and data storage.
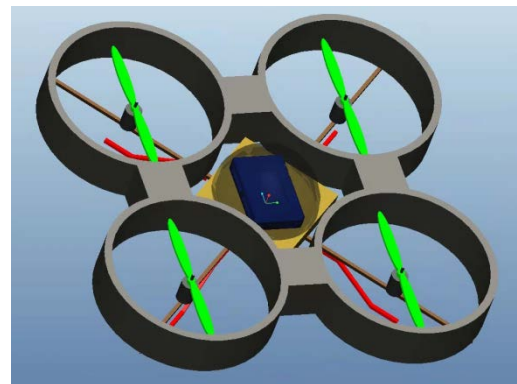
Lighter Than Air UAV
Sponsor: ASME
Department: Mechanical and Energy Engineering

Team Members:
Stephen Angliss
Edgar Coronado
Beau Kobel
Andrew Morren
Benjamin Ely

The American Society of Mechanical Engineers hosts a student design competition each year. This years competition is titled "Lighter Than Air UAV". The senior design team will be designing an unmanned aerial vehicle (UAV) to compete in the competition. The team will design and build a quadcopter propulsion and control system from scratch. The team will utilize the brand new I/O board from National Instruments called the "myRIO" to write LabVIEW code to control the quadcopters flight. The quadcopter will be required to carry a cargo and navigate through two gates and drop a payload. The UAV will be able to maneuver around and through obstacles, change height, and pass through a 28 inch hoop for sizing.

Propero – Human Powered Vehicle
Department: Mechanical and Energy Engineering

Team Members:
Eric Ryan
Craig Seykora
Samir Essiyad
Jordan Grazden
Aboubakre Benhaddou

The main goal of this project is to build a Human Powered Vehicle to compete in the American Society of Mechanical Engineers' yearly competition. We will have to compete in four different events, including a drag race, an endurance race, and an innovation competition judging what new technology we added to our design. Our team has decided to design a tadpole like vehicle, with two wheels in front and one drive wheel in back. It will be based off of the HPV's from the past years, but improved upon in both design and execution. We plan to implement a Continuously Variable Transmission (CVT) system for our main gear shift. Our design will also incorporate a fly wheel to store built up kinetic energy, allowing us to reuse it at a later time to reduce the work for pedaling.

Solid-State Heat Recovery Chiller
Sponsors: Titus, ASHRAE
Department: Mechanical and Energy Engineering

Team Members:
Micheal Shackelford
Jordan Jackson
Joseph Caldwell
Colin Patrick

The solid-state heat recovery chiller will remove heat from the controlled space and dissipate it into a thermal storage tank. The heat transfer will be accomplished by using thermoelectric coolers (TECs) sandwiched between two water blocks. The chilled water loop will be connected to an industry standard fan-coil unit, while the heating water loop will be connected to a heating coil within a domestic hot water tank. Each sub-assembly will require a
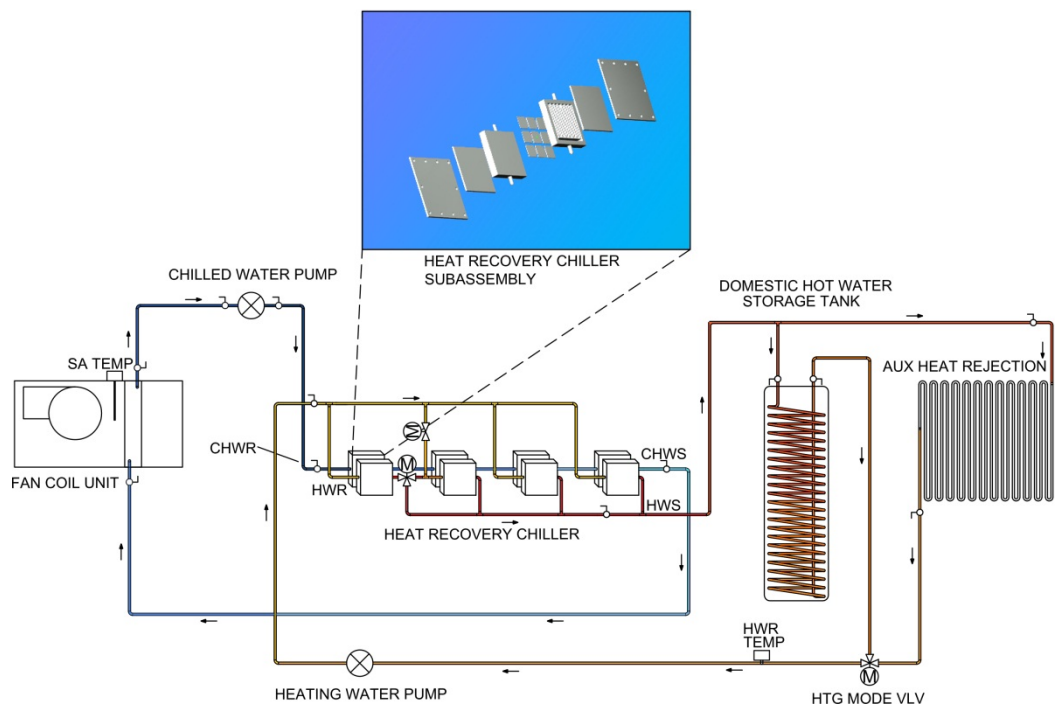
specific voltage that will be supplied by our custom power supplies. In addition, the hot-side water blocks must be piped in a series/parallel manner to maintain the required ΔT across the TECs. A digital programmable controller will be needed to operate the sequence of operations for the system. This controller will start the system pumps and fan-coil unit when the space thermostat calls for cooling. The controller will then stage on the TEC sub-assemblies based on the target chilled water supply temperature. The controller must also monitor the heating water return temperature to ensure that it is within the TEC operating range. If this temperature is too high the controller will modulate a three-way valve to allow heating water to pass through an auxiliary heat rejection device.

Elastomeric Seal Friction at Elevated High Pressure
Sponsor: Halliburton
Department: Mechanical and Energy Engineering

Team Members:
Nathan Posey
Richard Leverton
Hassan Azam
Ali Alsabti
Muhammad Hayat

The mechanism of friction in seals is not well understood. Empirical models are used to estimate seal friction for design purposes. Corresponding empirical data is not available at extreme pressures. For deep wells, the ambient pressure could be as high as 30,000 psi. For some of the actuators used in the high precision control systems, an accurate prediction of the seal friction is essential for design reliability. Utilizing these resources, five objectives will be carried out to accomplish this:

1. An inexpensive method will be designed to conduct tests to measure seal friction at 30,000 psi pressure.
2. An apparatus will be built for seal testing.
3. Data will be recorded using equipment at Halliburton.
4. FEA (Finite Element Analysis) tests will be used to predict the seal performance.
5. A semi-empirical model will be developed to help validate the data recorded from the laboratory tests.
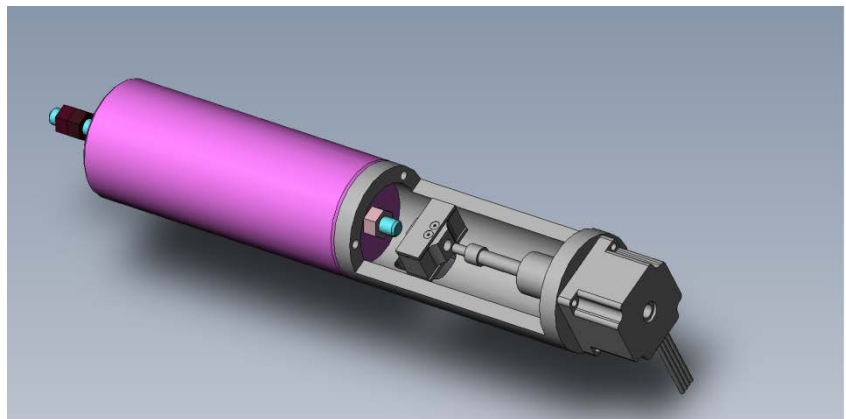
Diabetic Test Strip Dispenser Design Team
Sponsor: Tony Mendes, Director of the Murphy Center for Entrepreneurship at UNT
Department: Mechanical and Energy Engineering

Team Members:
Nevada Litterell
Robyn Boling
William Ray

Our project is to design and test a diabetic test strip dispenser. Design parameters include easy refills, easy for users with arthritis, large fingers, or other disabilities, and reliability. Difficulties within the design process are ensuring that the storage compartment is not easily contaminated by outside sources including humidity and air, designing a system that is universal and can be used with most test strip sizes, and designing a system that will dispense one strip at a time.

Design possibilities currently mimic a pen or mechanical pencil with a diameter approximately equal to that of test strip canisters for easy refill. It will be a two piece unit that will be screwed together with a gasket in between the cap and the main unit to ensure a satisfactory seal. The test strips will be dispensed by depressing a spring loaded button that will allow a single test strip to dispense using a feeder system that could consist of gears, springs, clamps, and/or rollers. Optimal button placement will be on the side of the unit.

Concentrated Solar Power System
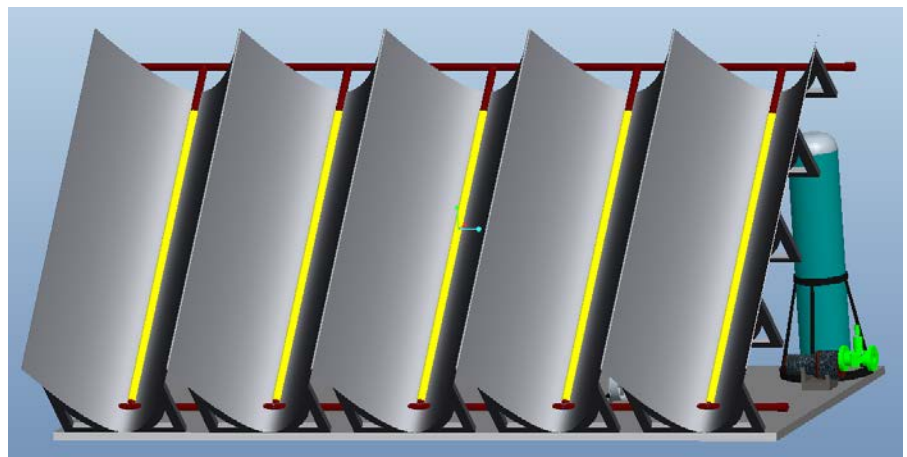**Department:** Mechanical and Energy Engineering

Team Members:
Luke Millier
Chris Jordan
Athan Himmelstein

The CSP (Concentrated Solar Power) system being designed will convert heat from the sun into usable electricity. The system has four main operating components: a solar heat collector, a steam engine/electric generator, a condenser, and a pump. Radiant heat from the sun is reflected off of the parabolic troughs and concentrated onto the evacuated tubes (located at the focal point of the parabola). The inner tube absorbs the heat and transfers it (through conduction) to the copper tube insert. The copper tube insert contains water which serves as the system's working fluid. The heat causes the water to change phases into a high energy vapor state (superheated steam). This pressurized steam will travel from the evacuated tubes to the steam engine. The steam engine creates mechanical work from the constant pressure expansion of the steam. This mechanical work is transmitted via belt drive to the pulley on the electric generator. The electric generator converts the mechanical energy into electrical energy. After the steam exits the steam engine, it travels directly into a storage tank where it will condense from steam into liquid. Once

it has phase changed to liquid, it can be pumped into the hot water storage tank ready to be re-heated in the parabolic troughs.

VARTM Skateboard
Department: Mechanical and Energy Engineering

Team Members:
Casey Liebel
Perry Pickett
David Shawl
Lee Smith

Vacuum Assisted Resin Transfer Molding (VARTM) is a process that uses vacuum infusion to create polymer composite parts. By pulling a resin mixture through a mold via a vacuum pump, organic materials not producible by other methods can be made due to its versatile operating temperature and pressure. Though it is a cost-effective alternative to other molding techniques, the technology is still relatively new, making its use uncommon outside of select fields, such as the aerospace and automotive industries.

Our project hopes to demonstrate the versatility of the VARTM process by creating a skateboard with a resin mixture that can compete with contemporary skateboards in terms of environmental impact, performance, and cost. The average skateboard is constructed from maple plywood. The VARTM board is constructed from a combination of polyester and kenaf to create a natural composite that eliminates that need without sacrificing the ability to withstand the variety of forces a skateboard is subjected to.

Thermal Storage Unit for Trane Residential AC
Sponsor: Trane
Department: Mechanical and Energy Engineering

Team Members:
Hayley Dawkins
Daniel Raherimanjato
Cristian Ugarte
Pratheesh Varghese
LaGronie Wyatt

The thermal storage unit (TSU) is an attempt to lessen the electrical demand of an air-conditioning system during peak hours of usage. This is for residential application with a variable rate plan. During the night, when electricity is free, the TSU stores energy in the form of freezing a phase change material. Then, during peak hours, the refrigerant is rerouted from the compressor to the TSU where it is cooled and sent to the indoor unit. This allows the outdoor condenser to be bypassed and the outdoor fan motor becomes obsolete. Consequently, the outdoor motor is turned off which eliminates one of the electrical components. Once the TSU reaches a temperature that is no longer efficient for removal of heat, it then switches back to the original AC system. The thermal storage unit is designed, such that the peaks and valleys of energy consumption in the average American home are minimized.
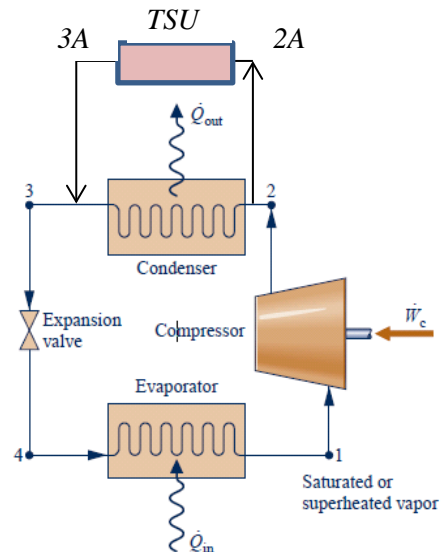
2014 Paccar & Cummins Lifting Eye Bracket
Sponsor: Peterbilt Motors Company
Department: Mechanical and Energy Engineering

Team Members:
Bryon Kelling
Allison Sharrock
Darren Hamel

Peterbilt Motors Company has approached our group to design an engine lifting bracket that will meet the strict cost and safety standards that their company is known for. The lifting bracket must be able to lift loads in excess of 3,000 lbs. for an extended period of time, while an operator works on properly marrying the engine to the truck. Brackets that are currently used have shown signs of early wear and tear, as well as being improperly sized and breaking critical instrumentation such as the trucks NOx sensor. This is unacceptable for a company that is producing trucks in excess of 500 per week. Our design utilizes stronger and more rigid material as well as a higher clearance for the lifting chain. This allows for the engine to be manipulated for an extended period of time without damaging the bracket, engine, or causing bodily harm to operators. To ensure proper functionality, we have worked closely with Peterbilt's engineering team and our resources at Ace Industries to guarantee that our lifting bracket can endure and outlast the lifetime of these heavy duty engines.

Team name: Halliburton VersaFlex ™
Sponsor: Halliburton
Program/Department: Mechanical and Energy Engineering
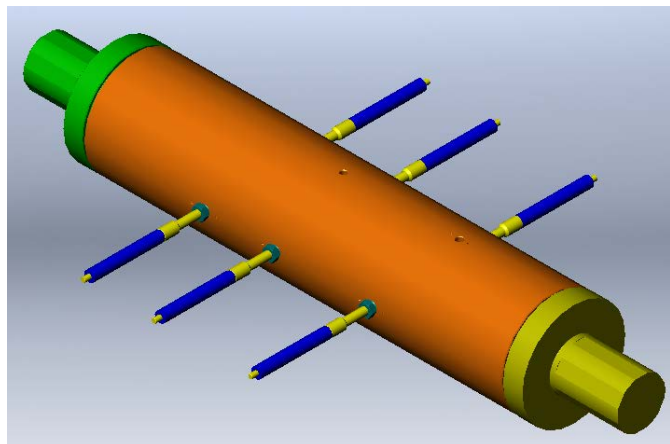
Team Members:
Michael McClain
Eric Lessmann
Ian Murphy
Brian Haselden
Brent Daugherty

Viton® elastomers are utilized in Halliburton VersaFlex® Expandable Liner Hangers to provide a gas tight seal between parent casing and the expandable liner hanger body. These elastomers experiences a change in

volume due to increasing pressure and temperature as the liner hanger is being run into the well. VersaFlex™ engineers model and evaluate hanger performances using a commercially available FEA program and existing elastomer modulus data. The bulk modulus of the rubber is one of the critical properties used to model performance. Current modulus data is generated from samples at low pressures and temperatures. To better model real well performance, Halliburton needs to be able to measure the behavior of elastomers under various simulated downhole conditions. The purpose of this project is to design, manufacture, and assemble a test fixture that will allow for real time measurement of the volumetric changes of the elastomer element under readily variable conditions including temperatures up to 350°F and pressures up to 20,000 psi.

Design of Deployable/Transformable Structure with Actuator
Department: Mechanical and Energy Engineering

Team Members:
Robert Heine
Juan A. Orona
Corey Chenoweth
Mathew Flores

    The goal of this project is to design two deployable and transformable structures. Both devices will be complex singular structures capable of expanding and collapsing with the help of actuation forces. These structures must fit through a cylinder of 10 mm diameter and 100 mm length. As the name implies, they must be deployed five times their initial size. At the very least they must resist a radial force of 50 N.   Following deployment, they must be collapsed and transferred back through the tube.   Our group has decided to design a spherical structure and a cylindrical structure. The cylindrical structure will be designed much like paper origami to enable the appropriate amount of deployment and radial resistance. The material used will be a biocompatible Shape Memory Alloy. The actuation will be done through heat transfer from a heat gun blowing warm air on the initial folded structure. This change in temperature will activate the alloy and expand the structure. The spherical design will be completely drawn up on Pro/Engineer software and transferred to the 3D printer here at Discovery Park. This design will resemble the classic Hoberman Sphere with some dimensional and linkage alterations. The actuation force will be a telescoping pnumatic piston where an increase in air pressure will extend the piston which will open the sphere, and after a certain pressure is reached will hold the sphere open as a locking mechanism. The Sphere will be retracted by releasing the pressure in the piston which will pull the sphere back into its' original shape, so it can be drawn back through the insertion tube.

Power Wheelchair with Tremor/Error Cancellation
Department: Mechanical and Energy Engineering

Team Members:
Rupesh Budhathoki
Saman Dhaubadel
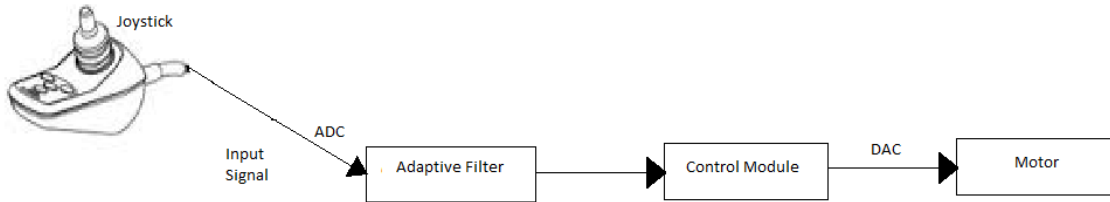
Jose Moreno
Zhe Shen
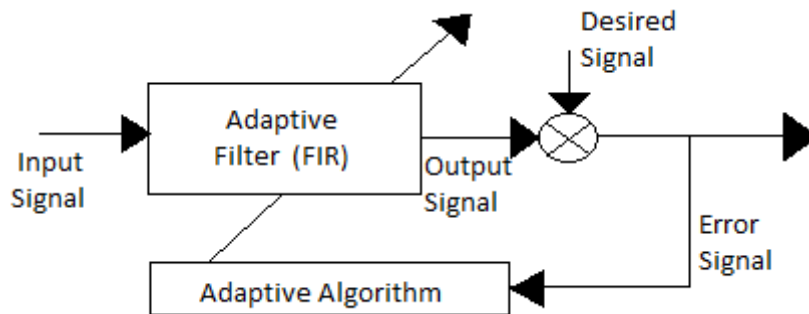Michael Smith

Figure 1: System Schematic

Figure 2: Block Diagram

In the United States along, 500,000 people suffer from Parkinson's disease with approximately 50,000 new cases being reported each year. Some not only suffer from this neurological disorder, but they are confined to a wheelchair as well. The tremor caused by the Parkinson's disease is added to the input signal from the joystick. This can cause a lot of disturbance and unwanted signals which can effect how easily a patient can move about. This project focuses on a way to cancel out the signal caused by the tremor by implementing a filter into the system required to run a power wheelchair. Testing on the filtering system itself will be carried out in Matlab before it is added to a wheelchair. When the desired results are obtained, a microprocessor will be programmed and the system will be added to a wheelchair to compete the project. Above is a simple schematic of the proposed system where the control module will be the PC with Matlab (microprocessor when added to the wheelchair). ADC and DAC is the conversion from analog to digital and vice versa.

Mechanical Engineering Technology

**Team name:** Mean Green Racing Formula SAE Chassis team
Sponsor: Design Engineering Inc., Humphery & Associates, Fastenal, Monster Tool Company, Ingersoll Rand, Solidworks, Student Government association, Mechanix Wear, Taylor Race Engineering, Redbull, Timken
Program/Department: Mechanical Engineering Technology/ Department of Engineering Technology

Team members:
Garrett Byrd
Jarrett Lemke
Henry Tran
Michael Bohrer
Kirk Tanner

The Formula SAE Chassis team is part of the University of North Texas' Society of Automotive Engineers (SAE) organization. The team was in charge of designing and building components for the 2013-2014 Formula racecar including: chassis, differential location system including rear brake caliper, engine mounts and ergonomics (gas/brake pedal assembly, shifter and clutch package, driver position and restraints). The goal for this year's team was to improve the 2012-2013 Formula SAE racecar design; while maintaining the same if not better reliability and reduce total weight. A full-scale model of the chassis and its components were designed in Solidworks. Once built; the racecar was tested to ensure all rules and regulations were met with the ability to withstand the stresses placed on the car during competition.
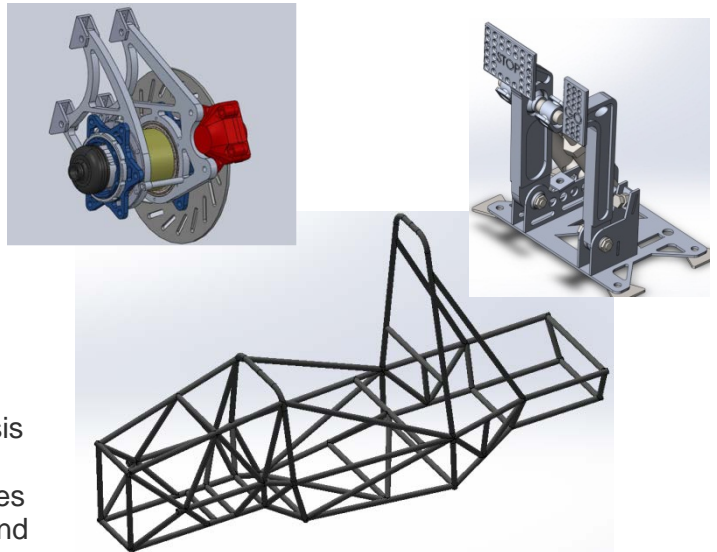
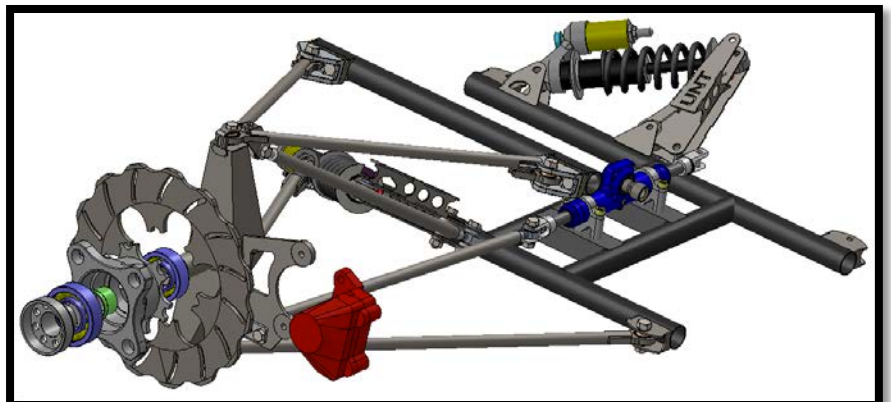**Team Name:** Formula SAE – Suspension
Sponsor: UNT Society of Automotive Engineers
Program/Department: Mechanical Engineering Technology/Department of Engineering Technology

Team Members:
Michael Goodman
Justin Burdine
Jacob West
Brandon Beard

The Mean Green Racing suspension team was responsible

for the design and manufacturing of the 2014 SAE UNT Formula SAE car. Formula SAE is a collegiate engineering competition in which students engineer, manufacture and a small scale Formula car. The completed vehicle is then entered in an international competition against other Universities, held in Lincoln, Nebraska. Specifically, this team is responsible for the steering system, shocks, control arms, brakes and anti-roll bars for this vehicle. Through special suspension software and FEA component analysis, this team has goals of optimizing the 2013 SAE UNT Formula SAE car by reducing unsprung weight, rotating weight, and manufacturing complexity. These activities result in an optimal setup to keep the tires in contact with the ground for maximum performance.

Team Name: Discovery 77
Sponsor: Team member sponsored
Program: Mechanical Engineering Technology/ Department of Engineering Technology

Team Members:
Joseph Dylan Beazley
James Petty
Chris Kosark
Garrett Hutson
Ryan Faulkner
Haydn Vaughan

Team Discovery 77 set a goal to create a wort processing machine that is fully automated, sanitary, cost effective, and is practical in any industry scale. The team controlled the mechanisms using a programmable logic controller (PLC). Common mechanisms used in the system were temperature sensors, pumps, valves, and heating elements. By controlling these mechanisms, Discovery 77 was able to control the time variables associated with the different segments of the process and the temperature variables associated with the heating elements. Furthermore, Discovery 77 was able to increase the overall accuracy of the process, and produce product consistently. Discovery 77 was able to gain enough funding through donations, (fund raising), and investors to construct a system that could fit in anyone's building, garage, or laundry room. This system is meant intended for any user to input their desired criteria, press a button, and step away from the machine. This keeps the user from contaminating the product during the process, and lets the user multi-task. Discovery 77 used their own skills to fabricate, build, and program the system so that it would be unique and personal. The team realized that not everything could be built; therefore, they had to purchase off the shelf items from helpful local businesses. Discovery 77 made sure to purchase and use only food grade materials because they knew that their machine would be used to produce an ingestible product.

TEAM NAME: E.C.I. (Eagle Cycling Innovations)
SPONSOR: Querencia Community Bike Shop
PROGRAM/DEPARTMENT: Mechanical Engineering Technology/Department of Engineering Technology

TEAM MEMBERS:
Oscar Angulo
Folabi Daramola
Matt Linn
Stafford Milton
Thiri Mon

Human-powered transport is often the only type available in underdeveloped or inaccessible parts of the world, and if well designed, can be an increasingly viable form of sustainable transportation. The Human Powered Vehicle (HPV) team built a cost effective and innovative HPV model to compete in the Human Powered Vehicle Challenge (HPVC) in April 2014 hosted by the American Society of Mechanical Engineers (ASME).

The HPV team built a test platform to have the ability to fine tune key design elements based on customer needs. The first element is a steering system that will imitate Ackerman's steering principles like that in the automotive industry. The second element is the wheelbase adjustability that is designed so that the front wheels can slide forward or backward. The third element is a gearing and drive system modified to provide greater efficiency of the rider's power produced. The fourth element is safety of the rider as the ASME rulings require certain safety features be implemented on the vehicle in order to participate in the competition. The final element is an eco-friendly design that emphasizes cost efficiency and innovation.

Team Name: BAK Aerospace Solutions
Sponsor: Zodiac Seats US
Program/Department: Mechanical Engineering Technology/Department of EngineeringTechnology

Team Members:
Brian Andrews
Denesh Ajakumar
Anthony Brooks

Zodiac Seats US in Gainesville, TX was experiencing problems in their seat back cushion and cover installation process. Assemblers had to secure the seat back structure into a jig and then place the cushion foam onto the structure. They then had to use wood spoons and plastic sheets to install the seat cover. This proved to be a very difficult and tedious process. There were also safety concerns present, since the assemblers had to reach into the cover during installation and were at risk of cutting their hands on the metal frame. BAK Aerospace Solutions

developed an installation mechanism that allowed for easier installation of the seat cover. The mechanism greatly improved product delivery time and resulted in a cost savings for Zodiac Seats US. The machine removed the assembler's hand from inside the cushion and seat back, and therefore reduced the safety risks during the installation process.

Team Name: Energy Assessment
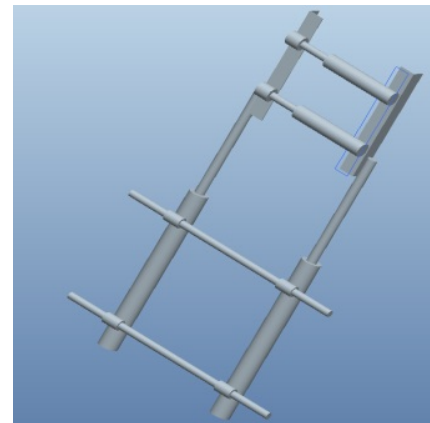**Sponsor:** American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE)
Program/Department: Mechanical Engineering Technology/ Department of Engineering Technology

Team Members:
Cody Walsh,
Abdulkader Alamoudy,
Abdulrahman Alsubhi,
Nayef Alamoudi,
Ahmed Basarih

A team of Mechanical Engineering Technology students focused on energy assessment regarding a small-scale house. The project implemented the two most common techniques in energy assessment process: (1) The air infiltration test (also called as 'blower door test' in industry) and (2) Infrared the thermography test.

Small-scale houses are periodically constructed by student teams in the Construction Engineering Technology program at The University of North Texas (UNT). One of these small-scale houses was available for the proposed project. The houses are constructed following the current industry practices in the region, and therefore closely simulate typical residential houses. The outer dimensions of the small-scale house are 6 ft. (1.8 m) length x 6 ft. (1.8 m) width x 7 ft. (2.1 m) height. It is constructed using 2 in. x 4 in. wood frames, and features R-13 insulation, Oriented Strand Board (OSB) sheeting, and engineered siding on the walls, along with vinyl windows and an asphalt shingle roof.

After completing the two techniques in the energy assessment process, the team used the information gathered that made the house more energy efficient, by implementing different energy saving methods. This was followed by repeating the two techniques to demonstrate improvements in efficiency. The team used the results to suggest the ways other people can utilize to make their private houses more energy efficient.

**Team Name:** CJT Peterbilt Delivery Kit
Sponsor: Peterbilt
Program/Department: Mechanical Engineering Technology/Department of Engineering Technology

Team Members:
Colter Souser
James Crawford
Tariq Safrah

The Peterbilt manufacturing facility in Denton TX is responsible for assembling all the Peterbilt Class 8 trucks on the road today. The plant is divided up into individual lines where certain tasks are performed, and CTJ was asked to design a way of delivering sub assembly kits from a "kitting cell" where all the parts for individual trucks are put together and then taken to the assembly line at one time. The line, called Assembly 1 South, was in need of some improved organization. Assemblers were spending non value added time retrieving parts for the trucks they were building, from mass part bins. Reduction of this non value added time by bringing the parts to the installers gave assembly personnel longer on the trucks to perform their jobs. This in turn, improved the quality of the work performed. This kitting system has been implemented in other areas of the plant and has drastically improved quality scores. Assembly 1 South posed particular problems in the amount of variation across the nine models available. Over 1000 parts in the area were compiled into about approximately 400 subassemblies. Designing a universal delivery system that will be able to handle this amount of variation represented the greatest challenge of the task.
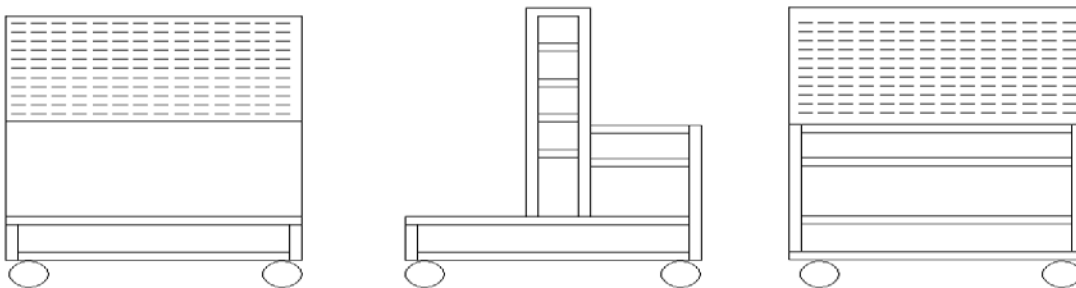
The above drawing is what the team has developed so far. Every part has its own designated spot for transportation and will be secured in for safety the overall footprint of the cart will be about 1 meter X 1 meter and the overall height will be about 1.3 meters.

Construction Engineering Technology

Team Name: ASL Construction, LLC
Sponsor: Allison Engineering Group
Department: Construction Engineering Technology

Team Members:
Fernando Landi
Francisco Silveira
Tanner Andregg

The team at ASL Construction, LLC was invited to design and build a 22 Unit Apartment Complex located in Denton, Texas. Primarily targeted towards students from surrounding Universities, the building will consist of one main unit with 22 apartments. Our goal is to construct a building while utilizing low installation costs.

For the past year the team has been able to utilize the tools learned during various CNET courses to make this project possible and profitable. After pairing with Allison Engineering group, we have designed a plan for our project in which we applied the construction methods learned these past years. In more detail, we have used tools which range from creating things like a project feasibility report, value analysis discussion, and marketing feasibility report. Additionally, we have also utilized various computer aided design software such as REVIT and On Center for cost estimating. Through the use of these tools we have provided ourselves with a solid plan, which will meet the client's expectations.

We are committed to providing our client with superior construction practices while maintaining appropriate business ethics. With this in mind, our goal for this project is for the thought of comfortable-student-living to be synonymous with that of The Hickory Street Apartment Complex.

Project Highlights:
- BIM Model using Autodesk Revit Structure 2012
- Green Building/ Energy Star Approved
- Cost Analysis using OnCenter Software
- Market Feasibility Report

Team Name: Strategic Builders Inc.
Sponsor: St. Mark Catholic Church
Department: Construction Engineering Technology

Team Members:
Kyle Gallagher
Luis Espinoza
Mychal Keys

St. Mark Catholic Church first phase of the project will include two buildings the Parish Activity Center, Religious Education Center, site balancing, and asphalt paving with a an alternate to substitute concrete paving. The two buildings consist of the 33,453 square feet with an estimated cost of $5 million. A preliminary budget has been set and has been broken into three categories, Site Work, Religious Education Center, and the Parish Activity Center.

- Parish Activity Center: Total Area: 21,453 SF Total Budget: $2,400,000
- Religious Education Center: Total Area: 12,000 SF Total Budget: $ 1,500,000
- Site Work: Total Area: 86,300 SF Total Budget: $1,100,000

This first phase of the project started August of 2013 is estimated to take twelve months. Phase two will start once the first phase has been completed and financing is obtain for the main Church.

Project Objectives:
- Incorporate energy efficient applications
- Use Building Information Modeling to develop a detailed image of the buildings
- Make a detailed budget covering construction cost
- Create a detailed schedule to help manage productivity and work flow
- Develop a risk/safety assessment plan

Team Name: Green Peak Construction , LLC
Sponsor: Allison Engineering
Department: Construction Engineering Technology

Team Members:
Mahsa Mahdavian
Jon Hardin
Johnathan Loper

Denton was named the best small town in America in 2012. This atmosphere was largely formed by the student population; therefore Green Peak Construction tailored The Woodlands community to fit student's needs.
Our project encompasses all aspects of constructing a student living apartment complex, complete with luxurious amenities that students will enjoy as well as a competitive price. The Woodlands will be located on Nottingham Drive in Denton, TX, placing it only a few minutes from downtown Denton, The University of North Texas, and Texas Woman's University. We envision The Woodlands becoming the next best student apartment living in Denton, TX.

Green Peak Construction Objectives:
- Redesign to meet green building standards
- Applying methods to shorten the construction process
- Using value engineering methods to lower budget costs while providing the same appeal and quality
- Reaffirming that the project will be successful

Electrical Engineering

Title: Social Media Integrated Clothing
Sponsor: Hyoung Soo Kim
Department: Department of Electrical Engineering

Team Members:
Kris Johnson
Nataly Torres
Michael James

We will be creating a scarf that will implement wearable technologies. The scarf will incorporate an Arduino LilyPad microcontroller as the controller of the system. The LilyPad will use a Bluetooth Mate to communicate with a cellular phone. The Bluetooth Mate will provide a channel to allow the LilyPad to communicate with an Android application we will develop. The application will serve to handle the data transfer from the wearer's Facebook profile and other social media accounts to update information in the LilyPad. The LilyPad will control numerous light-emitting diodes (LEDs) and implement changes to them based on social media updates. The scarf will also incorporate an ambient light sensor that will enable dimming to conserve power based on surrounding light conditions.

Project Title: Mean Green Solar Team – Solar Splash
Advisor: Dr. Miguel Acevedo
Department: Electrical Engineering

Team Members:
Adriana Blanco
Josh Brittain
Thomas Deshefy
Leonel Mendez
Bernardo Rivera
Glenn Sapien
Thomas Tracy
Emma Zemler

Beginning in 1994, the Solar Splash Competition involves racing solar powered boats designed in interdisciplinary groups at the university level. Competitors come from around the world to compete in this race. The Mean Green Solar Team desires to construct a solar powered boat to compete, representing the University of North Texas. To successfully construct a solar powered boat, the system will need to consist of the following electrical systems: solar panels, battery system, motors, data acquisition, communication system, and an effective energy management system. In addition to the electrical system, mechanical systems, such as the hull, propellers, drive-train, and steering, will be need to be developed simultaneously to create a working solar boat system. The design of the individual subsystems, testing, and integration will be completed by Design Day to ensure that the University of North Texas will be prepared to compete at the 2014 Solar Splash Competition, the World Championship of Intercollegiate Solar Boating.

Project Title: Wireless Data Transmission for Environmental Monitoring Systems
Advisor: Dr. Miguel Acevedo
Department: Electrical Engineering

Team Members:
Justin Peterson
Tuanlinh Nguyen
Jianning Xu
Andrew Saunders

The Environmental Monitoring Station (EMS) located on the Greenbelt (East of Denton) collects data about the environment. Currently, a researcher must go out to the station to collect data manually, which is time and economically inefficient. A group of graduate students tried to set up a system that utilizes two towers to wirelessly transmit data to the Natural Heritage Center (NHC). However, they were not successful at achieving this goal because of the height of the trees. Additionally, for a proper setup of the towers they must be buried into the ground 3 feet. The EMS is located on a state park, which does not allow equipment to penetrate the ground more than six inches.

In this project, our group decided to approach the problem differently by using a network of Xbees that go under the canopy of trees and a relay site (Nanostation M2) in order to facilitate data transmission. Once the information reaches the relay site, it is forwarded to the NHC, where it is uploaded onto the internet for processing.

Project Title: Instrumentation Panel Design
Sponsor: Dr. Miguel Acevedo
Program/Department: Electrical Engineering
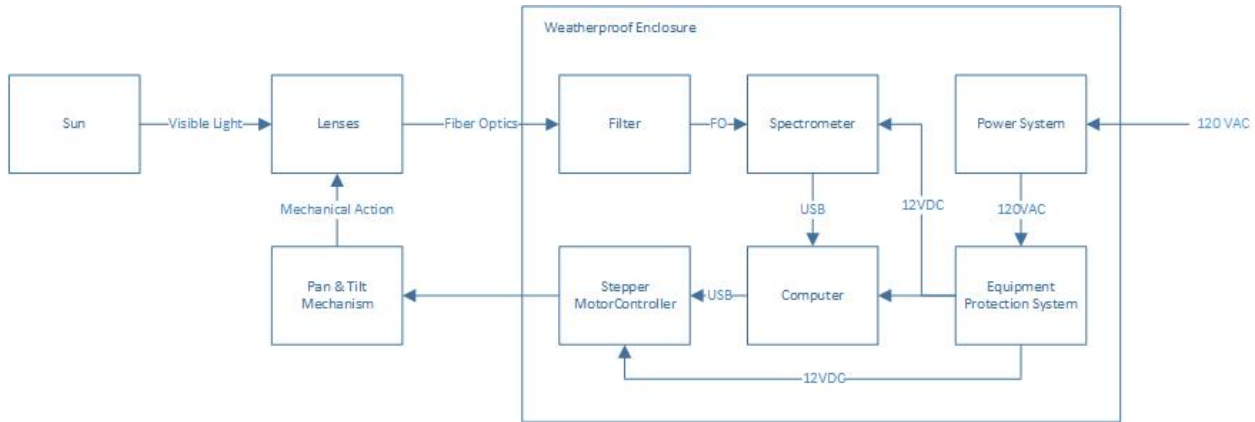
Team Members:
Andrew Faschingbauer
Jarred Stumberg
Timothy Eminger

Due to the large fluctuations of greenhouse gasses and their effects on our atmosphere, there has been a need for improved ozone monitoring. Our group's Instrumentation Panel Design will improve on an existing spectrometer system designed by UNT graduates, updating the hardware and software with new components to make the process more energy efficient.

Our project's goal is to design an instrumentation panel that houses all of the sensitive electronics used in the previous implementation while simultaneously making it all *portable* in

order to better serve the environmental monitoring industry. Figure 1 shows the dynamics of the electronics utilized within the instrument panel itself.

Project Title: E-Vest
Sponsor: Dr. Namuduri
Program/Department: Department of Electrical Engineering

Team Members:
Oscar Medina
Eric Brewer
Mohammed Alsadah
Ryan Johnson
Junaid Saeed

Our team is continuing on a several-year heart monitoring project. The goal is to design a system that could monitor the main vital signs, particularly EKG signal of a person. The system could detect anomalies in the signal, and wirelessly alert paramedics if a cardiac event is likely to occur. We have a rough prototype from a previous group that we will try to improve upon. The concept is to combine 3 EKG sensors, an analog signal filter, and a digital filter in a Teensy 3.0. The Teensy will sample the data from the analog signal and perform complex algorithms to acquire various useful EKG characteristics. The Teensy will then transmit the data via custom wireless to a nearby computer. The computer will then display the EKG characteristics of the person. All sensors will be mounted into a tight-fit athletic shirt. If possible, all processing electronics will also be mounted into the shirt as well.
Right now, each of the prototype's components is big and bulky. This semester, we will aim to redesign each component to make them smaller and more robust. We will also invest much development time into the code, material development, and custom antenna design. We will try to improve the whole design from many angles simultaneously.

Project Title: Servo Controlled Mechanical Flanges
Sponsor: Dr. Namuduri

Program/Department: UNT Electrical Engineering

Team members:
Alexander Wright
Jonathan Boutwell
Ben Camp

The design is for mechanical flanges that are controlled through continuous rotation servos that are triggered by electroencephalography (EEG) signal from a wireless headset. The design uses the "Star Wars Force Trainer" EEG toy, along with a microcontroller, 4 servos, and an interlocking system of chains to create movable flanges.

Project Title: Contactless Sensor for ECG Detection
Sponsor: Dr. Hyoung Soo Kim
Program/Department: Department of Electrical Engineering

Team Members:
Junaid Saeed
Surendra Prajapati
Oscar Medina
Brijesh Gurung

This project is a continuation of the electronic vest (E-vest) project used to measure and process cardiac signals. Some of the E-vest's aspects include software design, hardware design, and signal processing. Our team's overall goal is to improve upon the current sensors to make the E-vest truly contactless (in sensing cardiac signals at least). We have discussed this idea with Dr. Kim and have gained his approval to pursue this project and he will also serve as our faculty advisor throughout the life cycle of the project. Our team will begin by gathering information and work already done on this topic (contactless sensing of cardiac signals) to avoid redoing work done elsewhere and so improve upon existing designs. Some of this information will be provided to us by Dr. Kim and the rest will be dependent on our investigations mainly through the internet. After performing our research, we will design our researched method for sensing on a circuit simulator. The approach to completing this project is shown in the project schedule section of our project proposal (Contactless Sensor for ECG Detection).

Project Title: Dual Transmitter Instrument Wireless System
Advisor: Dr. Xinrong Li
Program/Department: Bachelor of Science/Electrical Engineering
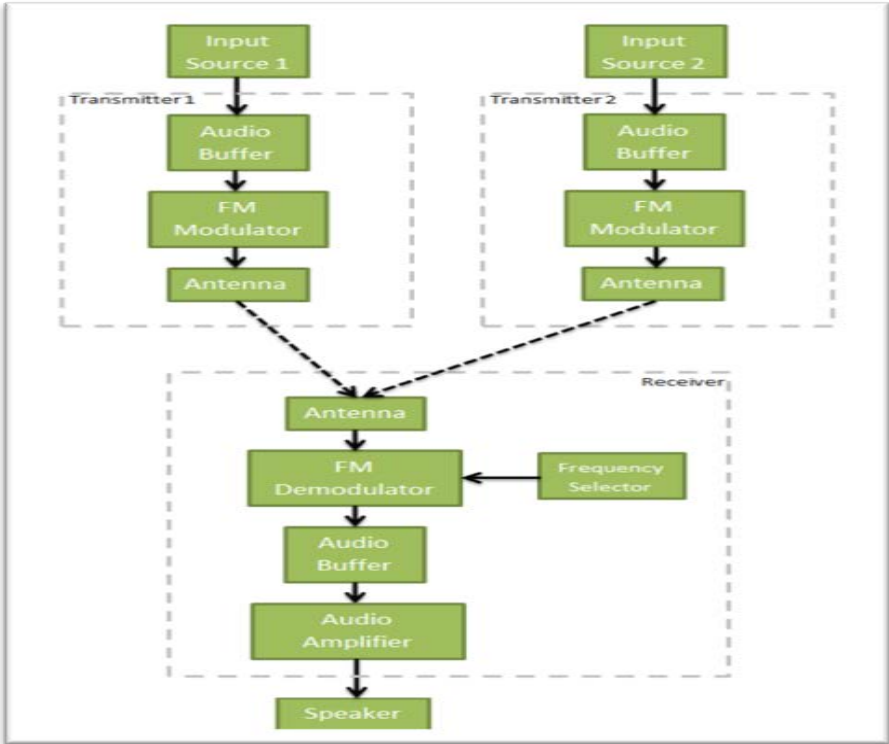
Team Members:
Joshua Jenkins
Jairo Rojas
Abiola Bakare

This would be a continuation from our senior design 1 project; our objective was to design and test a prototype for a single instrument wireless system that can accommodate up to two or

more instruments which would allow easier switching between instruments. We would continue to work on the Frequency Modulation (FM) and demodulation for the purposes of wireless communication. We have the intentions on possible upgrading our design to include the use of Bluetooth once we are done with FM implementation and to integrate our design into an enclosure for easier operation and cleaner design.

We will compare the quality of performance and sound of our design to a typical wireless system that one could buy in today's market. Most importantly, we will test the switching function of our design, and make sure that both received signals are distinct and clear. We plan to compare the quality of performance and sound of our design to a typical wireless system that one could buy in today's market. Most importantly, we will test the switching function of our design, and make sure that both received signals are distinct and clear.

Information Technology Majors
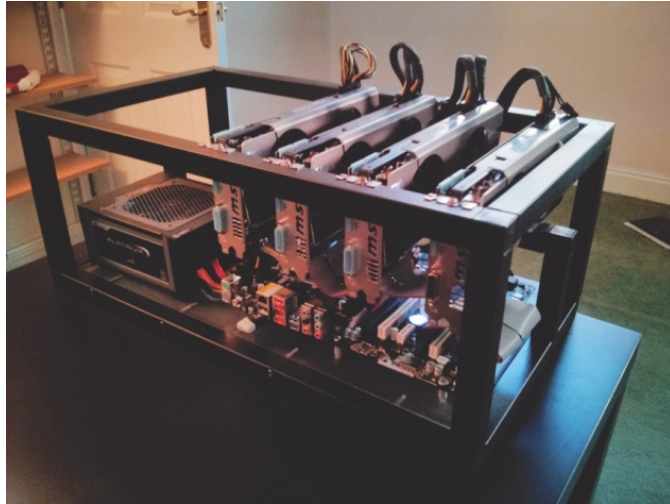
Team name: CSCE 4925 IT Capstone II
Sponsor: FrameTheTV.com
Program/Department: IT major / Department of Computer Science and Engineering

Team Members:
Aljabr, Sami
Alotaibi, Ahmed
Babaker, Saeed
Becker, Philip
Deberry, Blake
Hernandez, Henri
Lopez, Christian
Nelms, Brittany
Rico, Ruben
Saye Jr., Charles
Spencer, Taylor
Zepeda, Marcos

Advisor: Dr. Ryan Garlick

The IT Capstone class is building several machines to mine the Litecoin crypto-currency. Similar to Bitcoin, Litecoin is mined through using high end video cards to create new coins. Since solving the problem requires significant computational power, the problem is distributed across the Internet, with our machines solving part of the problem and sharing in the rewards. These coins are shared in a pool with the students, and can then be spent or converted into other currencies. The current US dollar price for Litecoin is around $24. Cooling the machines, configuring the hardware and software, and tweaking performance for maximum output, testing, reporting on performance, and report writing are all considered in the project. Students are also learning about how crypto-currencies work, the economics involved, and maintaining security of digital wallets.

Materials Science and Engineering

Project Title: Graded Porous Copper Foam for Improved Cooling of High Power Devices
Student Name: Stephanie Routh

High power devices require excellent thermal conductivity initially and then away from contact it is desirable to have rapid heat dissipation so that the devices can be tightly packed in ever increasing smaller spaces and reduce mechanical failure from overheating. In this study, a metal infiltration method involving a salt preform is employed to produce a continuous metal foam structures with no distinct solid metal/ foam interface for high power devices, which exhibit good mechanical, thermal conductivity, and heat transfer properties. Once the metal has infiltrated the salt preform, an acid can be used which selectively dissolves the salt preform, leaving the solid metal/ foam structure. One major advantage of using a salt preform is that it is

possible to create a continuous metal structure which is initially solid and then becomes porous, resulting in continuous thermal conductivity and heat transfer as well as good mechanical properties due to the lack of an oxide interface.

Project Title: A Computational Model for the Prediction of Microstructure within Inconel 718
Student Name: Thomas Ales

The COMSOL Multiphysics software package has been used to simulate an additive manufacturing approach for the state-of-the-art Ni-based superalloy ATI 718plus, coupling thermal, diffusive, and microstructural phenomena. Laser Engineered Net Shaping (LENS) is an additive manufacturing process that is seeing increased use due to its attractive energy and time requirements as compared to traditional manufacturing methods. Methods to predict microstructure though are not well developed, resulting not only in conservative design strategies, but also in missed opportunities where additive manufacturing enables microstructures for coupons not otherwise attainable. The model developed under this project aims to allow better understanding of microstructural development as a function of typical thermal histories encountered in the LENS build process.

Project Title: Blended Elemental Powder of Gamma Titanium Aluminides
Student Name: Wayne Adams

The purpose of this project is to gain a deeper insight and understanding of blended elemental powder on the microstructure and properties of gamma titanium aluminides. Gamma titanium aluminides are seeing increased used in demanding aerospace applications. The use of powder may provide an economically attractive manufacturing approach, and avoid technical barriers associated with casting. The high strength nature and ability to withstand high temperatures make face center tetragonal or gamma phase titanium aluminides highly effective in these procedures. The basis for this experiment will use an elemental blend of pure titanium, aluminum, and iron powders. The mixture of these small grain powders and exothermic reactions should allow for a homogenized mixture at low combinations of time and temperature for sintering. This ternary system will be sintered to reach the gamma phase in titanium aliminide powder mixture. Following this the sample will be subjected to DSC, SEM, EBSD, and XRD experiments in order to determine the structure, morphology, and mechanical properties of the material.

No Project Title
Student Name: Kelsey Lynch

Graphene is of great interest because of its high electrical and thermal conductivity, wetting transparency, and strength. Wetting behavior of graphene is investigated in order to understand the interaction between cleans chemistries and the graphene layer. In order to investigate this interaction, contact angle and several characterization techniques, such as Ellipsometry and Raman, will be performed on deposited graphene layers. The aim is to find out if graphene

does in fact exhibit 'wetting transparency' in cleans chemistries as has been shown for water. Graphitic oxide will also be prepared and characterized similar to graphene samples in order to determine its wetting behavior.

Project Title: Investigations In The Mechanisms of Carbothermal Reduction of Yttria Stabilized Zirconia for Ultra-High Temperature Ceramic Applications
Student Name: Brian Owens

High flight speeds present many challenges to aerospace design. Carbon-carbon composites (CCC's) are lightweight and have high strength, and are used on aircraft leading wing edges and nose cones. Hypersonic speeds can heat up outer aircraft skin to 2000 ºC, suffering loss of structural materials as carbon in CCCs oxidizes. We propose a 3 mol% yttria-stablized zirconia (YSZ) layer as a protective thermal barrier coating (TBC) on CCC's. At temperatures above 1657 ºC, the CCC and YSZ react to form ZrC at the CCC/YSZ interface. Since ZrC is a slower oxygen conductor than ZrO_2, and is less thermally conductive than YSZ, it should protect and improve the performance of the CCC and resist oxidation at hypersonic speeds. Variations in CO/CO_2 mixtures can cause the activity of carbon to alter significantly, possibly precipitating out of the gas mixture and causing reduction of ZrO_2. Current research has been focused on examining the effect of different CO/CO_2 ratios tested at high temperatures. Future work will involve a more intricate investigation of the unusually slow kinetics of C in ZrO_2, to potentially lead to a greater understanding of the C reaction mechanism with ZrO_2.

Computer Science and Engineering

Team Name: Int Elligence
Sponsor: Bill Buckles
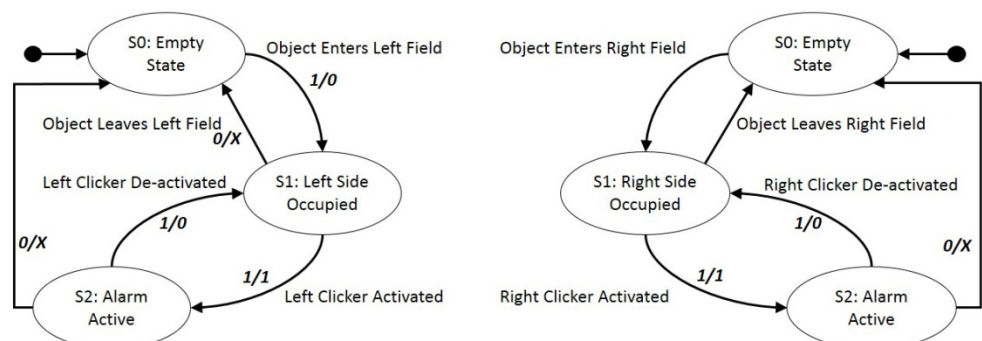**Program/Department:** Computer Engineering Department

Team Members:
Matthew Wiegmann
Shaun Hairelson
Ryan Cerrato
Tim Scrivner

Two Side – State Machine

State	Field Sensor	Turn Signal Sensor
S0	0	X
S1	1	0
S2	1	1

Our team's assignment is to create a Blind Spot Detection System designed for an automobile. The objective is to create a comprehensive solution that will allow a driver to get visual and audio feedback any time an object enters a blind spot of the vehicle. The system will have two small monitors which will present a live camera feed of the left and right side of the car in an effort to replace the need for utilizing side view mirrors. Any time an object enters the blind spot on the vehicle the system will provide the user with helpful feedback to ensure that changing lanes is safe. The first feedback comes in the form of a live feed showing the blind spot of the car. The second indicator is represented by a graphical interface on the screen that lights to warn when the blind spot is occupied. Last, the vehicle will provide an audible tone any time the driver activates a turn signal in the direction of an occupied blind spot. Utilizing cost effective technology, our project will improve upon the safety and experience of driving a vehicle.

Team Name: MediumWare
Sponsor: Bill Buckles
Program/Department: Computer Engineering

Team Members:
Pedro Torres
Brian Bergman
Jose Barcenas
William Ngu

Our project is to design and implement a frequency shifting device similar to a hearing aid. However, some users are deficient within a certain frequency range that a standard hearing aid will not help them. The device will shift the frequency range users can't hear into a range where they can hear. We are naming the device VFEAD which stands for Variable Frequency Electro-Acoustic Device.
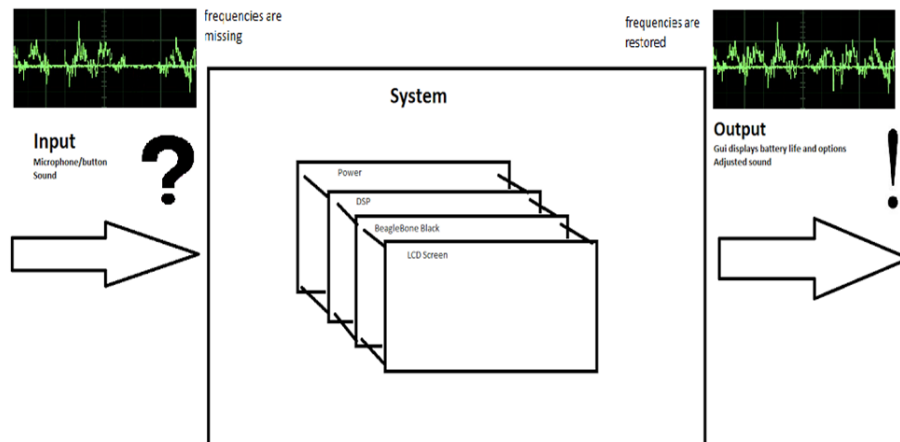
The illustration above is a quick and simple overview of what we're planning to accomplish. On the left is all the input such as incoming sounds picked up from microphones and user button

pressed on the device. On the right will be our output which will be adjusted sounds played through headphones and display on the LCD screen for the user.

Team Name: UNT Pioneers
Sponsor: Dr. Kamesh Namuduri; Dr. Bill Buckles
Program/Department: Computer Science and Engineering

Team Members:
Amber Mitchell
David Lowery
Desmond Hines
Jamal Gillis

Currently, quadcopter systems are programmed in a way that requires a large amount of human interaction to accomplish simple tasks. There is no platform available that allows quadcopters to collectively work together to accomplish tasks determined by a user. Our plan is implement a quadcopter system in which each quadcopter will operate in conjunction with other quadcopters to accomplish a certain task.

The goal of this project is to create the framework for, and a working prototype of, and autonomous swarm, consisting of multiple quadcopters, which is to perform a set of given tasks. The tasks will be selected by the user from a base station and communicated to the quadcopters over a wireless network. This network will allow the quadcopters and base station to send, receive, or update task information, maintain communication while performing the task, and to feed sensor and camera information back to the user. The project will use a minimum of two quadcopters to carry out the task of flying a specified route from Google Maps avoiding the risk of endangering lives and flying into random objects.

Team Name: Team CASA
Sponsor: Dr. Bill Buckles
Program/Department: Computer Engineering

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The objective of our project is to create an automatous delivery system through a car that understands the sound waves coming out from a sound generated device. The sound generating device creates tones which the car will translate as directions to follow through the use of a microphone. The sound generating device will be a speaker mounted on the car with the microphone right next to it. The speakers are programmed with specific tones to cover a range of commands for the car. The delivery system is preprogrammed with a predefined path to deliver an object at each specific destination. Objects will be laid out in chronological order of the delivery path. Once the delivery path is completed the car will return to its owner and it will turn off automatically or wait for new commands.