



UNT
COLLEGE OF ENGINEERING
SENIOR DESIGN DAY

Friday, April 29, 2011
University of North Texas
Discovery Park

Program

Welcome Reception	8:30 AM	B155 DP Auditorium
Welcome Address	9:00 AM	B155 DP Auditorium
Poster and project display	9:30-11:00 AM	DP Foyer

Project Presentations **11:30 AM – 5:00 PM**

1) Computer Engineering	B155
2) Information Technology	F223
3) Mechanical and Energy Engineering	D201
4) Electronics Engineering Technology	B190
5) Mechanical Engineering Technology	B185
6) Construction Engineering Technology	B192
7) Electrical Engineering	B242

PROJECT DESCRIPTIONS

1) Computer Engineering (B155)

a. "Soaring Eagles"

Chris Kane
Eloy Tavera
Mike Vondrasek
Shannon Wilson

A home electricity usage monitoring system with web-based analysis tools.

b. "Rewbiks Qweb"

Mzee Dillon
Mahsa Kia
Rex Lam
Malcolm Woods

A motorcycle safety system that includes obstacle proximity detection and helmet pressure sensors.

c. "Talking Transformers"

Terrence Bunkley
Alex Wright

A robot system that is able to use wireless access point signal strength measurements to determine position within a building.

d. "Crater Jumpers"

LaTonya Davis
Mario Kendrick
Jeremy Knott
Michael Mischo

An Artificial Intelligence-based, robotic, planetary probe that is able to determine if it can safely enter or must circumnavigate a meteor crater.

e. "Manhattan Project"

Andrew Arbini
Matt Ponce
Chase Przilas

A quad-copter based UAV with live video feeds to a base station.

2) Information Technology (F223)

a. "CSE Advising Portal Project"

Stephen Collins
Jesse Figueroa
Devin Joll
Michael McDonald
Miguel Torrez

UNT CSCE Advising contracted with Perfect Vision to resolve current issues regarding access to information concerning degree audits, locations and lab room information, along with other associated academic info, etc., and consolidate this information into an online advising portal.

b. "SETE Data Management"

Ishan Dosani
Beatriz Gomez
Nishivini Rae Rattey
Jacob Rhoads
Chris Worley

At the end of every semester, hundreds of students take the SETE survey online. These surveys are not gathered and organized efficiently. So, the officers of the SETE program are having a hard time reviewing the students' feedback. The mission of this project is to collect all the jumbled feedbacks and organize them in an orderly and easy to read fashion.

3) Mechanical and Energy Engineering (D201)

a. "Control of Parabolic Solar Collector"

2:00 PM

Matthew Zemler

Andrew Farris

Jared Fiorentine

Mark Demay

Solar Logic, Inc. is a renewable energy start-up company and part of the Discovery Park Incubator. Solar Logic uses eight parabolic troughs to concentrate sunlight and boil working fluid that drives their 10 kW_e organic Rankine cycle for power generation. A prototype system has been built to show proof-of-concept and to demonstrate superior economics to the competing technology, photovoltaic generators. The objective of this project is to build and test a system to control the position of Solar Logic's parabolic trough solar collectors within $\pm 2^\circ$ of the ideal position for sunlight collection to maintain acceptable power plant efficiency. The system consists of a three-diode solar sensor to track the position of the sun, a position sensor to measure relative position of the solar collector, and a micro-controller to manage all system information. Specifically, the micro-controller must: a) collect all sensor information; b) be able to receive a manual override signal to invert the solar collector; c) have an internal clock to determine sunrise and sunset; and d) have output data in the Supervisory Control and Data Acquisition (SCADA) format. A fuzzy-logic control strategy for managing the signal information from the three-diode sensor will be implemented and programmed into the micro-controller.

b. PID Control of DC Motor"

2:25 PM

Shane Harris

Minou Kia

Jarrold Speed

Jeremiah Walker

This senior design team is building a system to provide PID position control for a DC motor. The preliminary design of the DC motor control system will include a DC motor, a power source, a motor controller circuit, a position measurement device, a set of inertial, spring and dissipative loads, and an optional PID microcontroller (implemented either in software or hardware). The completed system will allow for the rotation of the loads over a predetermined angular displacement, and it will be packaged to accommodate the motor, loads, sensors, and all other necessary equipment.

c. Human-Driven Apparatus to Power a Home Entertainment System"

3:00 PM

Donny Johnson

Carl Frey

Michael Oleary

Michael Obu

This senior design group is creating a human-powered entertainment center to be showcased at Plano's 2011 Live Green Expo to teach the public about energy conservation. Visitors to this display will "feel" how much power is required to power common household electronics, which should induce them to turn off these appliances when not in use. The system functions by converting the rotational torque from a bicycle through a generator to power the home entertainment center. The participant will get on a bicycle and feel the resistance given by the required power for the electronics to operate. This year's team is improving the existing display constructed by a previous senior design team to: a) make the display easier to understand and more inviting to visitors, b) make better use of the available space at the Expo for the display, c) provide indicators to tell visitors whether they are peddling hard enough, and d) improve energy conversion efficiency so the display runs the full 12 hours of the Live Green Expo event.

d. Mechatronic Lab Development for MEEN Lab 2"

3:25 PM

Matthew Applegate

Zach Perry

Austin Short

This senior design team is developing four mechatronics experiments for MEEN Lab II, the second junior-level laboratory course in the Mechanical and Energy Engineering undergraduate curriculum. The experiments will be integrated into the course's existing series of lab exercises during the 2011-2012 academic year. The spirit of these new experiments revolves around the integration of concepts introduced in previous MEE coursework and their application to real-world technology.

e. "Harvesting Built Environments for Global and Accessible Modular Energy Audit Training"

4:10 PM

Matthew Recsnik
John Toland
Schean Lombard
Matthew Reynolds

The American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) is sponsoring this senior design team to develop an economical building energy auditing kit. The kit will be used by energy professionals in the U.S. and abroad to identify conservation opportunities in legacy buildings. Collaborative consultants on the project include engineering faculty in Egypt and Ukraine, who provide international perspective to make the kit globally accessible, particularly with respect to its affordability. With ASHRAE support, the students purchased professional building auditing equipment, including a blower door for infiltration measurement. They are reverse-engineering the professional blower door to inform design of their own blower door, which will be the central student-designed deliverable for this project. Once the students' blower door is complete, they will quantitatively compare the performance of their blower door against the professional door in a live building energy audit of Preston Tower, a high-rise residential building in Dallas, TX.

f. "Design and Testing of a Wind Tunnel Apparatus for Low Power Energy Harvesting Applications"

4:35 PM

John Garcia
Ted Hatch
Caitlin Roper-Foo

This project's objective is to test piezoelectric films in a wind tunnel to determine their ability to produce electrical power when flapping in the wind. Piezoelectric films are thin sheets of ceramic that generate a small electrical current when flexed. These films are typically used as sensors, but may serve as a viable alternative to current methods of harvesting wind power. The major goals of this project are a) to adapt the MEE Department's wind tunnel to generate velocity required to "flap" a piezoelectric film, b) to build a test fixture to hold the piezoelectric films in the wind tunnel, and c) to test the films to determine their power output at various wind speeds.

4) Electronics Engineering Technology (B190)

a. "Envelope Difference Index"

Oscar Chavira
Monica Salazar
Reza Dastmalchian
Joe Dominguez
Abdullah Al Qudaihi

The project focuses on the design and implementation of an Envelope Difference Index (EDI) prototype that can measure the distortion of hearing aids. This unit will take in two inputs: unaided (which will be the original waveform) and aided (which will be the waveform through the hearing aid). The unit will then display an EDI number, which is simply the difference between the envelopes of two signals. Once clinicians have this number, they can better determine which adjustments to make to the hearing aid or which hearing aid will work better for their patients. No such a unit is available today. This project has been sponsored by the Department of Hearing and Speech Sciences.

b. "Tele-lock"

Talal Al Anazi
Shadrach Buoye
Bolanle Akinde
Daniel Miller

The project-team will design and manufacture the Tele-Lock, a door lock that can be controlled via phone, RF remote and fingerprint reader. The Tele-Lock will find applications in households (ease of moving in, out and around the property; emergency evacuation and substitute for keys in case of losing them or for remote access), the commercial sector (by controlling access to sensitive areas and providing an effective way of operating gates) and the security sector (particularly the banking industry). The proposed product has many advantages over other commercially available competitors: costs less, does not require subscription fees, works with all cell phone models, and provides for alternative authentication (RF remote and fingerprint reader).

5) Mechanical Engineering Technology (B185)

a. "Cyclone Separator"

Matt Splittgerber
Ilyas Cetinkaya
Stephen Buko
Marcus Johnson
Mohammed Alali

Peerless Manufacturing contracted the project-team to develop a version of their separator used to remove water from raw natural gas pipelines. The team will design, fabricate, and analyze a prototype version of a cyclone separator. Cyclone separators are typically operated with elevated pressure environments. The experiment will substitute air for natural gas as the team's low density volume and water will be used as the high density unwanted material. By utilizing an existing wind tunnel system the team will be able to test a variety of intake speeds. Therefore the test vessel will function at room temperature and -1 psi to imitate a vacuum suction.

b. "Compact Vertical Gas Separator"

Mike Thedford
Ryan Hammel
Jeff Knape
Seth Rogers

This project has been sponsored by Peerless Manufacturing to refine the design of the latter's Vertical Gas Separator units. The basic principle of operation of these units is that wet intake air is drawn through an array of angled vanes to remove moisture. Ideally, the larger the array cross-section, the more water is removed. However, as the length of the vanes increase in proportion to the length of the unit, the pressure distribution at the cross-section becomes more and more uneven, until an area develops with virtually no airflow. At this point, increasing the vaned area merely makes the unit more expensive with no rise in performance. Hydra's design redirects part of the intake airflow to this dead region, creating a more even distribution and allowing all of the vane cross-section to work as it should. This will increase the performance of a unit of a given size or equivalently allow a given load to be met by a smaller unit. This is of tremendous value to installations such as ships, offshore oil rigs, and anywhere else where space is at a premium.

c. "Reverse Assist"

Robert Leavitt
Brenton Fite
Ryan Watkins

This manufacturing/design team provides professional aftermarket components to the motorcycle enthusiast. The project mission is to provide all riders with the ability to easily modify their bikes with highly desirable universal components that are not offered on factory bikes. The main focus has been to flood the aftermarket motorcycle industry with innovative ideas that surpass the customers' expectations. Marketing has been applied to various aftermarket retailers as well as third-party logistics companies. This is cutting the distributor and warehouse cost out of the supply chain, allowing for a greater profit margin. The company has purposely approached ideas that are not available elsewhere in industry, cutting competition.

d. "Salt Spray Machine"

Jesse Taylor
Sam Davis
Stephen McGee

In order to truly understand the physical properties and the effects of corrosion on metallic materials, the material needs to experience an increased rate of corrosion over time. To achieve these results, a salt spray machine needs to be introduced to the equation. Although many salt spray machines in the industry cost in upwards of \$10,000, the proposed salt spray machine will help attain the result required while also minimizing the cost and maintenance of the equipment. This machine will benefit all students and researchers by allowing them to have hands-on learning of the effects and physical properties of corrosion at a fraction of the price on today's industry.

e. "Cake Ball Assembly Line Design & Analysis"

Robert Carroll
Rich Powell
Darius Edwards
Pablo Del Abra
Hassan Al-Fadhil

The objective of this project is to design and build a virtual conveyor line processing system. A SIMULINK program needs to be constructed first followed by a LABVIEW analysis via software. The program will be run continuously, and the data will be saved on Excel. The results will show a finished product much faster than with physical prototype methods. Using analytical methods also makes it possible to reduce labor hours required, increase production number of goods, determine an energy efficient way to run the plant, and reduce cost. The conveyor process will be fully automated to control production rates and product uniformity. Each machine is designed and built with the highest level of quality and safety. For example, the machine will issue maintenance reminders to perform routine maintenance tasks. This system can be easily upgraded for future changes to the product line or upgrades an existing one.

f. "RV Cooling Fixture Design"

George Snitz
Garrett Frank
Maximo Delgado
Travis Carrico
Arminio Serrano

A major HVAC manufacturer in the Metroplex is experiencing thermal damage to components that require brazed connections during assembly. These components represent a part family with as many as 18 members. The team was selected by the manufacturer to design and validate a brazing fixture that: a) automatically accommodates part positioning, through a PLC, all members of the family which require brazing; and, b) incorporates a more effective heat sinking system to preclude much of the thermal damage previously encountered in the brazing process.

6) Construction Engineering Technology (B192)

a. "DART Orange Line Project"

Roger Rovira
Ayman Fawzy
Justin Coffey
Jacob Jourdan
Melissa Soto

The DART Orange Line is a light rail public transportation system that will span 14 miles from Dallas to the DFW Airport utilizing six stations in the areas of Dallas, Las Colinas, and Irving. This railway will serve as public transportation for a variety of commuters including students, tourists, and workers. Our project team is focusing on a model for stations of the light rail. We strive to create a more environmentally friendly structure fit for the 21st century. With concepts ranging from recycled materials, solar technology, and a unique use of landscaping, we will attempt to create an aesthetically attractive and energy efficient complex.

b. "Windsor Farms Residential Project "

Derrick Gage
Griffin Havard
Roman Thompson
Tibebe Alamrew

The residential team from the University of North Texas Construction Engineering Technology program is preparing a report on an anticipated residential subdivision located in the Northern part of Denton, Texas. The subdivision will include 41 lots with an average of .18 acres, or 7,840 sq. ft. of land per unit. The goal of the team is to provide affordable, energy efficient homes while simultaneously increasing the overall appearance of the surrounding area through architecture and tasteful landscaping. A total of four different home styles will be available to the future resident, each of which will be highly customizable. Meeting the projected demand for housing in the Denton area in a reasonable time period is paramount in this project.

c. "Napoleon Hollow Draw Bridge Project"

Noritsugu Yanagi
Jennifer Tran
Travis Stivors
Andrew Hedirc
Anthony Gonzalez

Highway 72 in western Illinois crosses the Napoleon Hollow Draw about 25 miles west of Jacksonville, Illinois. The bridge will be used for the westbound main lane traffic on IH 72. The current span across the draw is 345 feet. The bridge will be constructed to support an increase in traffic flow of approximately 6000 cars and 1700 trucks per day. The goal of our group will be to redesign the bridge with different materials, analyze and compare the results and choose the most economical design while constantly focusing on constructability. Our group will start by designing a five-girder, continuous concrete beam with one support in the middle. After analysis, we will design a similar bridge with steel girders instead of concrete. Both bridges will have the same 7-inch concrete decking for uniformity. Our structural analysis of the bridge will consist of analyzing dead load, live load (traffic load), wind load, and earthquake load.

d. "Dale Keeling Field House Project"

Terry Franlin
Adam Burnett
Bryan Daniels
Evan Evans

The Dale Keeling Field House is a 24,100 square foot athletic facility located in Fort Worth, Texas, constructed South of Everman High School between the school and football field. The overall goal is to develop and construct an athletic facility to support the massive population growth of the school and surrounding area and to ensure the facility has everything needed to continue the success of Everman ISD Athletic program. The target market of our industry is the Everman athletic department as well other schools with similar needs. The facility will provide locker rooms, a weight room, coaches' offices, a film room, and a kitchen. The land where the field house will be constructed was already developed so there was little site work needed to be done. Construction will begin as soon as demolition and cleanup of the current structure is completed.

7) Electrical Engineering (B242)

a. “Power Factor Correction using Average Current Control”

12:30 PM
Thomas Cobbinah
Deejay Woodrow

The upsurge of electronic device usage -- especially computers and their switching power supplies -- have increased the power factor and line harmonics on the utility grid. Therefore, it becomes important to find ways to minimize line harmonics and to correct the low power factor produced by the switching supplies. In this project, we will design and build a prototype boost pre-regulator convertor to combat low power factor and reduce line harmonics using average current control method. The design will be modular so that a different control method system can be connected without having to rebuild another boost converter circuitry.

b. “Ponded Infiltration Monitoring System”

12:50 PM
Britney Caldwell
Heather Howbert

The project intends to build an infiltration monitoring system using a wireless sensor network (WSN) mote at the Texas Environmental Observatory (TEO) station at UNT Discovery Park. Deployment of a soil moisture sensor and a tensiometer will allow for the measurement of soil moisture content and water potential in a single-ring ponded infiltration experiment. The sensors will be connected to a WSN mote, which will send real-time data to a PC monitoring the dynamics through a graphical user interface developed in LabVIEW.

c. “Nitrogen Laser”

1:10 PM
Aaron Jesseph
Bruce Dustin Wilson

In this project, we will build a nitrogen laser that uses a 6V dry battery to emit 10 pulses of ultraviolet radiation per minute. This laser takes in power from the 6V battery, stores it in capacitors then releases a short pulse of 20,000V. The laser will have an excitation mechanism, an active medium, and an optical cavity. Safety requirements are met by building a box enclosing the laser and containing the beam. The design will be simple and thus provide an extremely useful tool in the laboratory with low cost.

d. “Microfluidic Stretchable RF Electronics”

1:30 PM

Elom Akibode

Gaurav Manandhar

The objective of this project is to design a microfluidic stretchable RF electronic and to investigate its performance when it has been folded and stretched. The technology for realizing stretchable and foldable large integrated radio frequency electronics is gaining a great interest in health monitoring, medical diagnostics, wearable computing and curvilinear electronics. Microfluidic stretchable RF electronics are useful in many applications such as body-worn wireless sensor nodes, radio frequency identifications (RFIDs), and conformable skins for integrated robotic sensors and make the installation on curved interfaces easier. Through this project, we are looking to gain full understanding of antennas and Radio Frequency Identification. We will also gain knowledge in the fabrication of a stretchable and microfluidic antenna with polydimethylsiloxane (PDMS).

e. “Portable 120V Power Source using Solar Energy”

1:50 PM

Jeremy Sickling

Edward Starr

In this project, we will create a portable 120V outlet that uses solar energy. There are portable outlets that run on batteries and have to be recharged, but we could not find any that charged on solar energy. We also want to find a way to make the solar power more efficient. For example, a solar panel that rotates towards the strongest light. This could be used for yard work or camping, and it would be very useful outdoors during the day. It would charge only with solar power and would not be efficient at night, but it would save money on electricity during the day.

f. “Maximum Power Point Tracker for PV Cells”

(Oral presentation already given)

Katie Schniebs

Sam Bowman

In this project, a solar panel and Crossbow motes with MPPT will be put into practice to evaluate the feasibility of tracking current readings of the solar panel using a mote. Solar energy will be transferred to rechargeable batteries when weather conditions are not optimal for the solar cell. The result of the project will help determine how to power motes more efficiently through application of a maximum power point tracker (MPPT).