



Fall 2017 Senior Design Showcase and Duke Energy Symposium on Renewable & Sustainable Technology

Thursday, Nov. 30

Schedule

Industry Partner Breakfast*

8:30 a.m. – 9 a.m.

*Harris Engineering Center, Room 101(*by invitation only)*

Showcase of Projects

9 a.m. – 3 p.m.

Harris Engineering Center Atrium and Engineering II Atrium
See Table of Contents, all project summaries and locations
in the following pages

Duke Energy Symposium

9 a.m. – 10:30 a.m.

Harris Engineering Center, Room 101

Introduction: Michael Georgiopoulos, Dean

"Building a Smarter Energy Future in Florida": Tamara Waldmann
Director, Florida Distributed Generation Strategy, Cogeneration and Renewables, Duke Energy

Senior Design Project Presentation

"Triton: Water-Monitoring Probe for Guard Dog Valves" (see page 11)
Graduating Mechanical Engineering Students Paul Darbyshire, Alice Granda,
Brandon Halterman, Zavanio Van Ravenswaay, Jonathan Sookdeo, Yahsiel Torres

Senior Design Project Presentation

"Hybrid Energy-Harvesting Platform: Solar and Foot Traffic Energy" (see page 8)
Graduating Electrical Engineering Students Travis Badall, Sanjay Khemlani,
Michael Lin, Kiara Rodriguez

Awards Reception

4 p.m. – 6 p.m.

Harris Engineering Center, Room 101

Enjoy refreshments as CECS alumni volunteer judges
recognize the top projects in each discipline and honor Best In Show

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Project Summaries
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11-12	Mechanical and Aerospace Engineering

Project Summaries and Table Locations

Projects Involving Multi-Disciplines

Scanner for Automated 3D Modeling of Small Objects

Electrical Engineering; Photonics Science and Engineering; Computer Engineering
ENG II, TABLE 51

With the increase in 3D printer use, the demand for 3D scanners is increasing. But 3D scanners are typically very expensive. 3D scanners eliminate the need for expensive and complicated software that is often used to 3D print a project. This 3D scanner will be an inexpensive option for enthusiasts and hobbyists to scan any small object in real time to produce a printable text file to be sent to a 3D printer. The user will be able to "clone" any small object with this scanner and a 3D printer.

"SmartKart" Smart Shopping System

Computer Engineering; Computer Science
OUTDOOR COURTYARD, TABLE 63

With sensor technology, this project aims to save time and relieve the everyday stress of shopping by eliminating checkout lines. This system tracks all items placed into the customer's cart and, upon exiting the store, their credit card gets automatically charged. No more coupon-cutting with the SmartKart shopping system, thanks to the app that will automatically apply currently existing coupons and deals.

Optical Wireless Communication: A Laser Ethernet Transceiver

Electrical Engineering; Photonics Science and Engineering; Computer Engineering
ENG II, TABLE 52

The ability to communicate with optical signals has advantages over radio signals: less interference; the line is secure because it can remain in the room or on target (beneficial in situations where a radio signal can be sensed); and it works in situations where cable cannot be installed. This project's transceiver board converts an electrical Ethernet signal into an optical light signal at 10 Mbps. This solution could be used in military applications or to learn about photonics' possibilities.

Project Summaries and Table Locations

Computer Science

Inventory Management System for Oviedo Fire Department

OUTDOOR COURTYARD, TABLE 71

System streamlines how firefighters log the status of their equipment through menus or QR codes, and makes it easier for supervisors to access the reports. System includes a smart phone app and web portal.

UCF Guard Tours

HEC ATRIUM, TABLE 8

Developed for UCF, this security and emergency management system provides effective security guard task management, location tracking and reporting. Employing field communication tags placed on buildings to confirm tasks, it logs all important data for effective security measures and reporting, notifies guards to patrol certain areas, and enables efficient methods of communication for guards in emergency situations.

Quikcut Video Management Platform

HEC ATRIUM, TABLE 9

Provides a video solution for youth football teams. The concept improves upon a similar product on the market by providing live upload feature, so that coaches can check the video on the field, and athletes can get feedback for their plays during timeout. It is intended to cost less than a competitor product.

Job App for H Net

HEC ATRIUM, TABLE 11

An iOS application and accompanying mobile website with an easy-to-use interface to help humanities and social science professionals seek employment. The application uses a “Tinder” styled carousel scrolling platform. Only job postings that match the candidate’s selected fields will appear.

Efficient Genetic Matching for Multi-Allelic Sequences

HEC ATRIUM, TABLE 13

An algorithm that provides an efficient method for finding matches in large sets of genetic sequences. The method may prove useful in the field of bioinformatics, particularly in detecting genetic ancestors.

Developed for UCF bioinformatics researchers Shaojie Zhang and Ardalan Naseri.

Athlete "Mindfulness" Communication App

OUTDOOR COURTYARD, TABLE 64

An application designed to help coaches track player progress, and that allows for two-way communication between coach and players. The app digitally stores player performance data, and provides coaches with analysis charts and graphs and comparison data.

Online Teacher Dashboard for UCP of Central Florida Bailes

HEC ATRIUM, TABLE 14

At this Orlando school for children with special needs, teachers use numerous applications and websites for attendance, assignments and file management. This customized, centralized system features an easy-to-use online dashboard to retrieve information from the websites used by each classroom, stores it in a database, and presents a summary to teachers/ administrators. This system is intended to bring all administrative tools together as seamlessly as possible, to allow teachers to spend more time with students.

Project Summaries and Table Locations

Computer Science

Semi-Autonomous Quadcopter Control

OUTDOOR COURTYARD, TABLE 65

Designed for researchers in the computer vision field, the system provides a user interface that will command drones to fly designated paths; to take photos of designated objects; and to take pictures of people in a predetermined area.

ARLO: Autonomous Robot Learning via Observation

OUTDOOR COURTYARD, TABLE 66

Program teaches an autonomous robot to learn to complete a certain task by observing recorded videos of the task being completed while under the control of a human operator. The goal is to eliminate hard coding of robotic actions.

Autonomous Transformation of Lock-Free Data Structures

OUTDOOR COURTYARD, TABLE 67

Software transformational tool that yields 120 percent efficiency. Intended to help software developers. Possible applications include increasing efficiency of relational databases.

Utility Line Inspection Web App Using Computer Vision Algorithms

OUTDOOR COURTYARD, TABLE 68

Reduces the time it takes to repair a damaged power line by increasing the speed of damage detection. The web application will recognize when a line is damaged using machine learning techniques.

UCF Mechanical and Aerospace Engineering Inventory Tracking System

HEC ATRIUM, TABLE 15

An inventory system designed to help the department with loss prevention. Maintains a catalog of all items owned, their storage locations and who possesses or uses which items.

Attendance Made Easy (AME) in a Single Picture

HEC ATRIUM, TABLE 16

Provides instructors with the ability to take a single picture of the class to record attendance using facial recognition technology and machine learning.

Image Compression and Translation Using CNN

OUTDOOR COURTYARD, TABLE 69

Using convolutional neural network framework called “pix2pix,” this software can translate images from one representation to another. For example, it can translate hand-drawn sketches into realistic-looking faces. A possible application could include assisting crime investigators get a better idea of what a suspect looks like based on an artist’s sketch.

Pre-Med Central: Web Portal and Mobile App

OUTDOOR COURTYARD, TABLE 70

A one-stop resource that provides all-encompassing guidance to students who intend to pursue a medical degree. The web and mobile app includes these sections: general guidance; an emulated American Medical College Application Service application; medical school suggestions based on user's individual metrics; calendar reminders and notifications; and personalized statement advising for a small fee. Can be used by advisors and administrators to review students' information.

Project Summaries and Table Locations

Computer Science

Web Portal and Mobile App for NASA's "Scribe" Transcription Service

HEC ATRIUM, TABLE 17

Will facilitate access to transcriptions of ground communications channels at NASA's Kennedy Space Center by replacing the previous pen-and-paper system that would take days before transcripts were available. This electronic system can provide near-real time access to information.

ELLE (EndLess LEarner): Learn a Second Language with Virtual Reality Video Game

HEC ATRIUM, TABLE 10

Developed for UCF language instructors, this system enables users to learn a second-language through immersive and entertaining gameplay. Players navigate through a track while answering language comprehension questions. The downloadable game can be played with virtual reality or on a desktop. This project demonstrates Portuguese language. The goal is implementation in several UCF language curricula. Faculty can use the system to track student progress. The virtual-reality version will be tested and compared alongside the non-VR desktop version to research learning effectiveness.

Sensubot: Medical Financial Web-chat Bot

OUTDOOR COURTYARD, TABLE 72

A web-based chat bot that will assist people through the often confusing medical financial maze. The system can also be used by hospital financial counselors. Designed for people who seek financial aid for relieving medical debt but do not know where to find it; and for organizations that wish to market their financial services. How it works: the chat-bot asks questions, and based on the user's answers, it will provide customized financial options.

AIMM: Artificial Intelligent Music Maker

OUTDOOR COURTYARD, TABLE 73

This artificial music composer is capable of writing full-length, multi-instrument scores. It includes a variety of applications: Movies; Games; Musician Writers Block. The technology uses different neural networks and algorithms that try to emulate a composer's mind.

"Flockit" – Collaborative Music Playlist

OUTDOOR COURTYARD, TABLE 74

This application allows users to easily create, manage and contribute to playlists in real time. Download the app and then create "Parties" which other users can join, add music to, and vote on songs to affect song playback. Search for music from Spotify, YouTube and your own uploaded music libraries.

Project Summaries and Table Locations

Electrical and Computer Engineering

Preventing, Anticipating and Mitigating Off-Task Behavior in Special Needs Students

OUTDOOR COURTYARD, TABLE 75

To address special needs students' difficulties with transitioning between subjects, this wearable wrist-watch styled device has an LED timer which is activated by the caregiver to prepare the student for a transition, and reduce off-task behaviors. Features sensors that measure skin temperature, sweat, heart rate and other indicators of stress or anxiety, and sends an alert to the teacher to anticipate such behaviors. Sensors also activate a touchscreen drawing activity to help the student relax.

acSequencer: LED Audio Sequencer Unit with Mobile App

OUTDOOR COURTYARD, TABLE 76

Enables the user to access and control sound samples and their sound configurations in the sequencer unit via a mobile app connected to the unit via Bluetooth. This project can be used by electronic musicians who are interested in a small, portable unit that allows for smooth workflow and features a large wealth of sound samples. The mobile device does the "heavy lifting" in the often complex task of audio sequencing.

NextGen Asset Tracking (NAT) Device

HEC ATRIUM, TABLE 2

This item tracker uses a primary GPS and secondary INS tracking through data collected by a motion tracking device. Its small size easily attaches to key rings, shipping containers, nurse carts, tool boxes, and other items that typically get misplaced where it's hard to receive GPS signals. This project offers a low-cost solution to a high-cost problem.

The Batpack

HEC ATRIUM, TABLE 3

Provides hands-free assistance for people who are blind or vision-impaired. A combination backpack and goggles, it provides haptic feedback (vibrations) in the direction that the objects are located. The user's distance from objects is relayed through the strength of vibrations. Provides multiple feedback devices: ultrasonic sensors, laser distance sensors, and camera for line detection.

Universal Asset Management Systems

HEC ATRIUM, TABLE 4

An alternative solution to inventory management that requires less manpower, and less time to obtain the physical inventory for comparison with expected inventory. This project is a radio frequency identification reader (RFID) scanner that can attach to a variety of mobile platforms to easily, quickly and safely scan inventory. This project is more portable than anything on the market, and can be used on industry-grade drones for scanning anything from warehouses to cattle fields and cargo ships.

BRAIN (Bluetooth Recreational And Integrated Navigation) Smart Helmet for Motorcycles, Bikes

HEC ATRIUM, TABLE 5

This smart helmet connects to a phone and can show navigation instructions, audio streaming and calls. Uses a low-power microcontroller to decode instructions sent from the companion application from Bluetooth mobile device. The helmet can be upgraded to add additional modules.

Project Summaries and Table Locations

Electrical and Computer Engineering

"The Garaginator" Parking Garage Assistant and Application

OUTDOOR COURTYARD, TABLE 58

Improves on current car counting systems in parking garages by using simple photodiode sensors placed at each garage entrance and exit. Each sensor has a laser light aimed at it. When the laser is broken by a car, the sensor sends a voltage to a microcontroller housed in a kiosk. The microcontroller then sends a signal to a phone app and updates the information in near real-time. The kiosk also allows users to quickly input their parking spot location to track where their car is located.

FollowBot: Autonomous Luggage Cart

HEC ATRIUM, TABLE 1

A luggage-carrying robot that follows you using Bluetooth synching technology connected to your smart phone. Perfect for parents with kids and strollers; travelers in wheelchairs, more. This idea is better than a smart suitcase, which adds about 20 extra pounds and takes up valuable space. The concept is for airports to rent out the FollowBot to travelers as they make their way to their gate. The idea could be expanded for use in convention centers, concert venues and more for display and equipment setup.

Active Noise Cancellation Headset

OUTDOOR COURTYARD, TABLE 77

A low-cost portable headset that cancels out the noise from the surrounding area, in any situation. It uses four microphones (two on each side) that receive the ambient noise. That sound is processed by a microcontroller that will create a signal that effectively cancels out noise.

Hybrid Energy-Harvesting Platform (Solar and Foot-Traffic Energy)

OUTDOOR COURTYARD, TABLE 59

The device harvests energy from the sun and electromechanical energy from human foot traffic into a Lithium-Ion battery that can charge devices such as cell phones. In high foot-traffic areas, it could be scaled up to power street lights and signs and more.

Portable Watering Device

HEC ATRIUM, TABLE 12

Most automatic watering systems are designed for yards and larger areas. This system allows apartment and condo residents to grow healthy plants efficiently with a smartphone application. The user can manage the system from any location. Ideal for residents of apartment homes where plants are grown on balconies or small areas.

Aqua Sentinel: Anti-Drowning System for Personal Pools

OUTDOOR COURTYARD, TABLE 60

A detection-and-response system to reduce child drownings, designed primarily for caregivers of children who cannot swim and are in close proximity to pools. The main system sits by the pool and acts as a monitor. When a child who is wearing special bands enters the pool water, the monitor will send an alert signal to the caretaker's phone, or call for help. The system also streams video for added monitoring.

Project Summaries and Table Locations

Electrical and Computer Engineering

Aquatic Control Suite to Automatically Maintain Aquariums

OUTDOOR COURTYARD, TABLE 78

The system will read or diagnose aquarium factors such as temperature, pH, water cleanliness, water volume, and more. This system seeks to integrate all the functions from other automatic aquarium maintenance systems, and is designed to not obstruct other aquarium components.

Multi-User Volumetric Display System

HEC ATRIUM, TABLE 6

Proof-of-concept design of a volumetric display for virtual- and augmented-reality systems. Produces a holographic effect so that objects appear as if they are inside the display. Moving around changes the shape of objects similar to the real world. Explores applications in collaborative game design.

Smart Harness for Dogs that Measures and Tracks Vital Health Readings

OUTDOOR COURTYARD, TABLE 61

Measures heartbeat, temperature and has a step counter. Connects to a smartphone app with Bluetooth technology. Data can be shared with others, including veterinarians and owners of similar breeds for comparison value. A team member's dog will be available to demonstrate.

S.M.A.R.T. Fire Alarm System

HEC ATRIUM, TABLE 7

Enhances the modern fire alarm system to provide building occupants with the fastest path to an exit of a building depending on where the fire is located. Alarms use wireless communication, LEDs, and cascading sounds to provide users with direction to the most efficient exit.

Clever Coasters: Wirelessly Communicating Smart Drink Coasters

OUTDOOR COURTYARD, TABLE 79

Intended for restaurants to improve service workflow. Each coaster carries a weight sensor that can detect when drinks are nearing empty. This concept has been explored but not commercialized or perfected. This team seeks to make the coasters low-cost, reliable, accurate and easy-to-use.

Secure Phone Locker with Integrated Notification Tracking (SPLINT)

ENG II, TABLE 53

This device uses a verification system that pairs one phone to one owner in the system. Can be used to improve workplace productivity by removing the distraction of a cellular device; and can be used in any setting that requires the removal of personal cellular devices for security reasons.

Automatic Guitar Tuner for Beginners and Experts

OUTDOOR COURTYARD, TABLE 80

A low-cost, handheld programmable guitar tuner that also helps musicians calibrate their ear to hear if the guitar is properly tuned. Easy and intuitive. The device works by programming a desired note, listening to the frequency of the string, and physically tuning the knob until the note is within a low margin of error.

Project Summaries and Table Locations

Industrial Engineering and Management Systems

Mission Mars Smart Dashboard for NASA

ENG II, TABLE 39

NASA works with many institutions on research that supports their missions. But tracking multiple projects with multiple institutions can be challenging and inefficient. This team has created a user-friendly research project dashboard that will alert managers of delays more efficiently, thus allowing for more timely corrective action.

Florida Hospital Discharge Turnaround Process Improvement

ENG II, TABLE 40

This team applied the Lean Six Sigma methodology to significantly reduce the amount of time it takes to prepare a patient's room, which now takes 230 minutes on average after discharge.

Discharge Refinement at Parrish Medical Center

ENG II, TABLE 41

To help the client standardize and improve the discharge process and meet the goal of 50 percent of discharged patients released by 2 p.m., this team used the Lean Six Sigma methodology to optimize and simplify the tasks involved, and provide patients with an "above satisfactory" experience.

Facility Expansion Design for FreshPoint

ENG II, TABLE 42

FreshPoint's facility is expanding exponentially, and management wants to ensure that current order deliveries do not suffer with the added business. This team created a facility design to ensure that the picking and packing process is streamlined and efficient. The design ultimately will promote the on-time delivery of current and future business orders.

New Stanton Tool Crib Economic Order Quantity and Reorder Points

ENG II, TABLE 43

To support Siemens in their effort to merge two tool-crib facilities into one, this team developed a solution to optimize the inventory, streamline processes and reduce costs. The current process includes job-site staff who order tools and kits, and staff who inspect and return the tools into the inventory.

Process Improvement in a Mushroom Production Facility

ENG II, TABLE 44

This team was tasked with solving the company's problem of the packing department keeping up with demand due to outdated equipment, standardized procedures not being followed, and poor equipment layout. After studying the current processes, this team provided a low-cost, practical solution that will decrease waste in a specific area of concern.

Welding Design for I-CON Systems, Inc.

ENG II, TABLE 45

The welding procedure at I-CON consists of taking multiple metals and joining them by fusion and/or using filler material. The highly laborious process involves high temperatures and hazardous light emissions. Welders perform the work based solely on experience and not on a specific process. This team collected and analyzed data to provide recommended changes that will enable welders to operate more effectively and increase productivity.

Project Summaries and Table Locations

Industrial Engineering and Management Systems

Discrete Simulation Model for Wyndham's Check-In Process

ENG II, TABLE 46

This team created a data-driven 3D simulation model that can be used to represent the Wyndham lobby and show possible solutions to reduce queue length and wait times. It allows variation of inputs and "what-if" modeling to test a variety of solutions in a risk-free environment. The base model can be used at other Wyndham resorts for lobby improvement, and could be adapted for other areas of Wyndham operations, such as parking.

Process Improvement and Simulation for Siemens' FAST Warehouse

ENG II, TABLE 47

This team was tasked with using simulations of the current warehouse and proposed states to drive process improvements and help inform facilities design decision makers. The simulation provides key performance indicators that show why the proposed improvements should be implemented. Siemens will be able to automate repetitive tasks, and reallocate manual labor into tasks that require more attention to detail.

Mechanical and Aerospace Engineering

Microgravity: Vacuum/Thermal Chamber

ENG II, TABLE 38

A weather balloon-drop system to be used in a high-altitude of 120,000 feet. The UCF Physics Department's current testing chamber has capability to produce a low-air density environment, but their system is unable to cool a test specimen to the required temperatures to simulate the low temperature environment needed. This solution, a thermal vacuum chamber, simulates both conditions: low-air and low-temperature.

HydroRidge: Solar-Powered Water Heater

OUTDOOR COURTYARD, TABLE 54

An aesthetic water heater that installs on a roof ridge. It heats water two ways: with solar technology and with convection caused by attic heat exiting the ridge vent. This system serves as an alternative water heating supply, and provides the additional benefit of ventilating a home's attic space.

Triton: Water-Monitoring Probe for Guard Dog Valves

OUTDOOR COURTYARD, TABLE 55

Commercial irrigation systems run on a timer only, which means if it's raining, the watering is unnecessary and wasteful. This water-conserving water probe detects soil moisture. When the soil is saturated, a signal is sent via Wifi to the irrigation system to shut off. This project improves upon water sensing probes on the market today that are poorly designed or tend to corrode.

Mobile Education Center for UCF Office of Sustainability

OUTDOOR COURTYARD, TABLE 57

A solar-powered mobile education center that showcases how people can reduce waste and their carbon footprint, and increase sustainability in their everyday life. Features interactive exhibits and showcases how UCF is meeting its three main sustainability goals of carbon neutrality; zero solid and potable water waste; and integrating sustainability across all academic disciplines.

Project Summaries and Table Locations

Mechanical and Aerospace Engineering

Aero Shell: High-Altitude Microgravity Experiment Platform

A system that produces ideal conditions for repeated microgravity research experiments on Earth. Microgravity research is a more feasible, less costly alternative to sending research to outer space for zero-gravity testing. But current microgravity testing platforms do not allow for prolonged or repeated testing. This aero shell solution allows for repeated testing, a prolonged testing time, and at a lower cost. It includes a broad array of environmental sensors to collect and store data. The aero shell is attached to a tether, reel and brake system. Sponsored by the Florida Space Institute and the UCF Physics Department. (Three teams)

BLUE TEAM: ENG II, TABLES 18-21

RED TEAM: ENG II, TABLES 22-25

GREEN TEAM: ENG II, TABLES 28-31

"Solar 7" Water Purification System

OUTDOOR COURTYARD, TABLE 62

A water purification system customized for a community in Haiti in urgent need of potable water. This team has created a solar still that uses solar thermal energy to purify contaminated water. It is low-cost, easy to mass-produce and simple to build and use.

Regolith Collection Bin Unloading & Field Redistribution System for NASA

A project for NASA's Robotics Mining Competition, which challenges college teams to create a robot to dig simulated lunar sediment (known as regolith) from an excavation zone and place it into a collection bin. The need now exists for a system that can return the regolith to the excavation zone. This system works with a vacuum hose that intakes the regolith from the collection bin. The regolith then goes through a cyclone separator and out of a pipe on the other end to eliminate the possibility of a dust cloud. (Three teams)

BLUE TEAM: ENG II, TABLE 33

GREEN TEAM: ENG II, TABLE 34

RED TEAM: ENG II, TABLE 35

Sensei: Sensors-and-Controls Learning Kit for Engineering Students

ENG II, TABLE 32

This kit gives engineering students supplemental education and practical experience in sensors, controls and programming, in a fun and engaging way. The kit includes parts and materials, and tutorials.

Micro Unmanned Aerial Vehicle Using "Push" Propulsion (Vs. Conventional Pull System)

Teams were challenged to create an unmanned aerial vehicle that can fly a two-pound payload for as many laps as possible at a specified location using at least one electric pusher propulsion system. (Four teams)

BLUE TEAM: ENG II, TABLE 48

GREEN TEAM: ENG II, TABLE 49

RED TEAM: ENG II, TABLE 50

UNSPECIFIED: OUTDOOR COURTYARD, TABLE 56

Robust Vane Flow Fixture Design for Power Systems Manufacturing

Client company provides turbine services for power plants. These teams were tasked with reducing turbine vane testing time and minimizing air leakage during testing to ensure accurate results. Teams tested a set of gas turbine vanes to ensure their cooling holes function properly. (Three teams)

BLUE TEAM: ENG II, TABLE 26

GREEN TEAM: ENG II, TABLE 27

RED TEAM: ENG II, TABLE 37