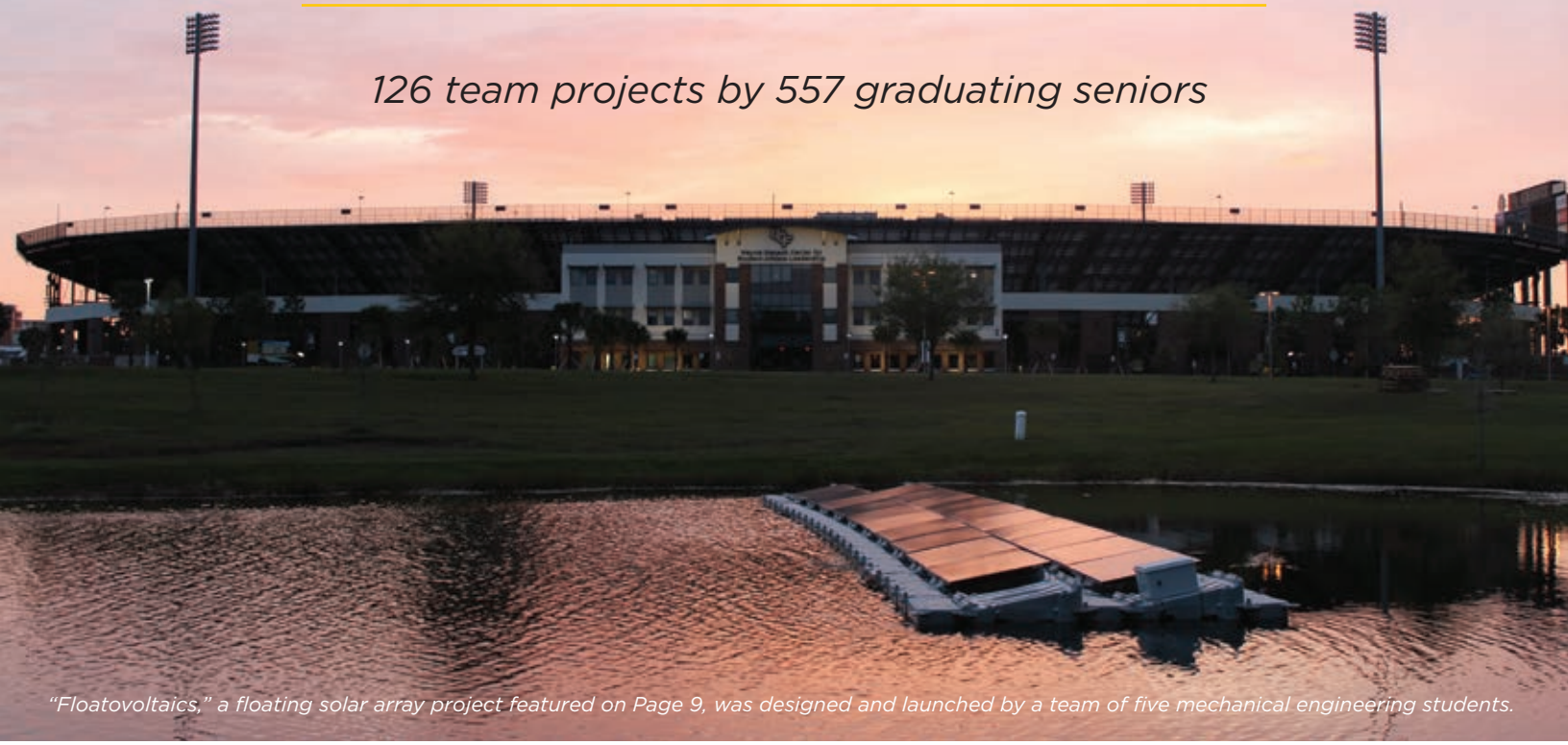
UCF College of Engineering & Computer Science

Friday, April 22 | 8 a.m. - 2 p.m.
Engineering I and II Bldgs., and Harris Engineering Center

Spring 2016
Engineering and Computer Science
Senior Design Showcase

126 team projects by 557 graduating seniors



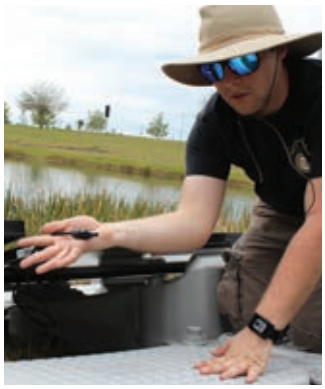
"Floatovoltaics," a floating solar array project featured on Page 9, was designed and launched by a team of five mechanical engineering students.

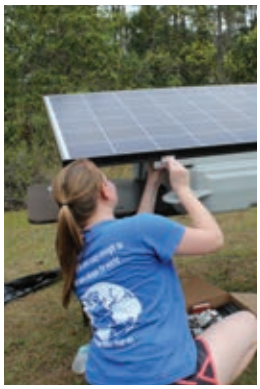
Distinguished Guest Speaker

Dr. Arun Ramaswamy

Chief Engineer, Nielsen and UCF Electrical Engineering Alumnus
M.S. '92 and Ph.D. '94

11:30 a.m.
Engineering II, Room 102





UNIVERSITY OF CENTRAL FLORIDA • ORLANDO

ELECTRICAL & COMPUTER ENGINEERING

39 Projects, 149 Senior Design Students

Mind Games: Control Items with Brain Waves, Heart Rate, Muscles Movements

Project demonstrates a model-sized car controlled with brain waves and head tilting; a water fountain controlled with heart rate; and an arcade claw machine controlled with head tilts and eye movements. For entertainment use. (Table #7, HEC 101)

Doggy Pal Smart Collar

Wirelessly monitors a dog's heart rate, temperature, location and body position. Displays all information it collects to a website and sends alert to owner. Data can be shown to a veterinarian to guide diagnosis and treatment. Inspired by a team member's dog that had seizures. Current products have fewer monitoring devices and cost more. (Table #8, HEC 101)

Tamper Automated Alert Gadget (TAAG)

Device is placed on everyday objects (cabinets, doors, gun cases, etc.) and sends an alert to user's mobile phone if the object has been moved or opened. Current market products are expensive and lack efficiency. This project is highly efficient, reasonably priced. (Table #9, HEC 101)

Pre-Paid Power System

Team tasked by Texas Instruments to create innovative way for consumers to monitor and pay energy bills. Project is an app so customers can pre-pay a certain amount and receive power. Once payment is made, the system allows current and voltage to flow to the load and turn on. Phone is used to monitor energy usage & spending; and make adjustments. (Table #10, HEC 101)

Electri-Surf: Motorized, Phone-Controlled Surfboard

Battery-powered, motorized surfboard to propel the rider without waves or a speedboat that is wirelessly controlled with a smart phone. Similar products on the market are expensive and not largely produced. Possible applications include recreational or for rescue purposes. (Table #11, HEC 101)

Wander Watch to Track Alzheimer's Patients

A comfortable, affordable watch for Alzheimer's patients to wear. Sends location information to caretaker's Android app if patient leaves a designated geo-fenced area. (Table #12, HEC 101)

Autonomous Firefighting Robot

Increases firefighter safety by autonomously navigating through a maze using sensors, finding the fire source and suppressing it with a heavy-powered fan. Robot also can be manually operated. Possible alternative to humans using fire extinguishers in buildings. (Table #13, HEC 101)

KnightHome Energy Control System

App-controlled system manages energy use in a home (HVAC, wall outlet, etc.) with a smartphone. Also tracks how much energy each component is using by day, week, month. Easy to implement. (Table #14, HEC 101)

Wireless Wearable Electrocardiogram

Monitors cardiac activity and heart rate in dynamic environments. User can monitor their heart's electrical activity without constrictive wires used in conventional ECGs. Sensors collect data readings and wirelessly transmits to an analytics hub. Then the information is sent to the user for real-time monitoring. Data readings are stored in a database. (Table #16, HEC 101)

WayPoint: Indoor Robotics Navigation Solution

Indoor navigation continues to be a challenge for service robots because of limited ability to connect to GPS satellites. This project uses Bluetooth beacons (vs satellites used in GPS systems) to function similar to GPS navigation. The beacons enable the robot to know its position in a room and plan a path towards a defined destination or waypoint. (Table #23, HEC Atrium)

NIGEL: Home Automation System

Smart home system proof-of-concept. Includes a main hub for Wi-Fi communication and user-to-appliance communication, a smart outlet for appliance control that monitors power, a smart lighting switch for wireless lighting control, and a mobile app for users. (Table #24, HEC Atrium)

Maze Zone Drone

Uses an air vehicle and ground vehicle to communicate and autonomously solve a maze. Could be used in the military or as a parking spot locator. (Table #25, HEC Atrium)

Laser Data Transfer in Air

Small, lightweight, dependable way of sending and receiving information. Establishes a secure and stable communications connection using line-of-sight open air laser transmission. A laser signal that pulses on/off at a high rate is sent from a computer to a receiver that converts signal to an output device. Unlike other communication systems (ex: fiber-optic) b/c the laser transmits through air. Possible military and directional Wi-Fi communications uses. (Table #26, HEC Atrium)

Portable Coil Gun

Portable, more powerful coil gun that accelerates a projectile using a magnetic field created through the coils. Its 12-volt DC battery is boosted up to 350-390 V to charge a capacitor bank, which is then discharged across a multi-layer coil. Resulting magnetic field accelerates projectile through and out gun barrel. Real-time data shows on LCD screen. (Table #27, HEC Atrium)

*Bragg Optical Spectrum Analyzer (BOSA)

Analyzer uses a Bragg grating as the working element. OSA is used to measure the intensity of the input light at a certain range of frequencies. Bragg grating is a special type of grating that has high spectral selectivity which could give project high resolution. Designed for researchers. **Among UCF's first senior design projects to emerge from the Photonics Science and Engineering bachelor's degree that UCF began offering in Fall 2013.* (Table #28, HEC Atrium)

Next Revolution in Robotic Versatility (NERV)

Allows user the ability to control a robotic arm with the motions of their own arm while providing haptic (touch) feedback. Offers a novel approach by using accelerometers, gyroscopes and magnetometers. Provides a more natural sensation of controlling the arm over traditional joystick control systems. Safe, lightweight, low cost, with intuitive control. (Table #29, HEC Atrium)

Solar-Powered Inductive Drone (SPIDRONE)

Self-operating drone that follows a user-provided path, flies, lands and charges without human interaction. More accurate over GPS-guided systems when landing on solar charging docks. (Table #30, HEC Atrium)

*SunLED Project: Artificial Skylight

Centered in research on how artificial light affects the human body, such as circadian rhythm disruptions, sleep disorders, etc., via a recently discovered third receptor in the retina (the ipRGC). Artificial skylight matches the sunlight spectrum dynamically during the day and avoids triggering the ipRGCs at night. Team has developed a thin film to aid in matching outside feel. Ultimately it creates a pleasant, more natural way to light a room. For use in hospitals, office buildings, schools and more. **Among UCF's first senior design projects to emerge from the Photonics Science and Engineering bachelor's degree that UCF began offering in Fall 2013.* (Table #31, HEC Atrium)

Energy Guard

Through interconnected sensors and devices, building-associated energy usage can be minimized by the touch on a smart phone. Device allows homeowners to schedule, manage and secure their home from any location without costly, invasive installation. (Table #32, HEC Atrium)

T.U.B.A. – The Ultimate Bionic Arm

New electronics package for use by Limbitless Solutions in the group's low-cost bionic arms to improve stability and functionality. Includes haptic feedback, multiple EMG sensor input; multiple servo output; environmental protection; wireless charging; wireless programming. (Table #33, HEC Atrium)

ELECTRICAL & COMPUTER ENGINEERING

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Multiplex Bionic Arm

For Limbitless Solutions. Intended for above-elbow and below-elbow amputees. Arm is actuated by EMG signal processed by a micro-controller and used to control 4 motors in order to choose the desired gesture or grip. Small 1.3 inch display. Will provide better response time, more accessibility features, longer battery life and 3 to 5 gestures. (Table #34, HEC Atrium)

Smart Home Automated Power Expense Regulator (SHAPER)

Designed to help homeowners save energy and power consumption. Controls home lighting, thermostat settings and will display how much power each device is consuming. System is inexpensive to install and better informs resident of power usage. (Table #35, HEC Atrium)

Smart Grill

Work the grill from a distance. Ideal for multi-tasking while grilling food. Relays temperature, and employs a mobile application and an LDC screen. Sends alerts to the user with information from three sensors. (Table #36, Outside HEC)

Heimdall: Wireless Gas Leak Detection System

For residential use in homes that use natural gas appliances. System detects a gas leak and turns off the gas valve, preventing further leakage, and sends alert to residents. Designed to be accurate, precise, power efficient and affordable. (Table #37, Outside HEC)

Renewable Energy Skateboard

Solar-powered, electric motorized skateboard controlled with user's smartphone via Bluetooth. Charges while on-the-go, and is controlled by an item most people already hold, thereby eliminating the need to hold an additional controller. (Table #38, Outside HEC)

Head On for Motorcycle Riders

Increases rider situational awareness and safety by providing instrument, navigation and object proximity data to the rider through a full-face motorcycle helmet modified to contain a display. System also includes a sensor component that is fitted on the motorcycle. (Table #40, Outside HEC)

Air-To-Ground Recon System

Quadcopter hovers over and photographs a maze and sends the photo to a computer for solving. The solution is sent to a robot that navigates accurately through maze. More accurate and efficient than current maze-solving robots that rely on trial and error methods. Could be used in search and rescue missions. (Table #41, Outside HEC)

Finding Bodies with GOOL: Grave Operating Object Locator

Smartphone-based system that sends electromagnetic signals into the ground and reads the signal to determine the presence of a body or casket. For use by graveyard owners, crime scene investigators or genealogists. System costs less than $100; whereas typical ground penetrating radar (GPR) costs more than $15,000. Project replaces "grave dowsing," a superstitious technique to locate burial sites when cemetery records are unreliable; or disturbing graves which is considered taboo. (Joint project with Computer Science team listed on page 13.) (Table #42, Outside HEC)

Harmonic Analysis for Quality of Service (HAQS)

Senses, digitizes and analyzes the voltage and current outputs of standard single- and three-phase power outlets using an analog-to-digital converter and microcontroller, which serves as the brain of the system. Records and analyzes waveforms, and displays results of the analysis on a touchscreen LCD. This low-power, low-cost microcontroller provides a greater range of analyzed frequencies over current power meters. (Table #43, Engineering I Atrium)

Emergency Vehicle Detection System

Helps drivers hear emergency vehicle sirens with microphones that "listen" for sirens. System continually takes sound samples in the car cabin. Signal processing technology measures cabin sound frequencies. If it detects a siren, the system will turn off the car stereo and sound an alert. (Table #43, Outside HEC)

SenseWalk 2.0: Smart Cane for Visually-Impaired People

Stores frequently-used routes, transmits information to the user (location, what direction they need to take soon). Has Bluetooth capability to send preprogrammed routes. Uses a laser sensor for object detection and a solar panel for charging while in use. (Table #44, Engineering I Atrium)

Dragon Bee

Controls a drone using MSP430, which simulates radio frequency signals. An app will be used to communicate to the MSP430 via Wi-Fi. Camera-equipped drone will send pictures and videos to the user. Multiple modes are available on the user's smart phone with easy-to-navigate menu. (Table #44, Outside HEC)

Sign Language Interpreter Glove

Lightweight, portable and energy efficient glove that allows the user to translate American Sign Language signs of alphabet letters to an external display. Inspired by a team member who experienced difficulty communicating with his speech-impaired sister. (Table #45, Engineering I Atrium)

Smart Water Rocket

Improving Space Trek Summer Camp water rocket (a manually operated science experiment) to make overall system work more efficiently. Altimeter has been redesigned to relay information faster. Rocket's launch pad angle has been automated. Features can be viewed and manipulated by children on smartphones for increased interaction & entertainment. (Table #45, Outside HEC)

Forearm Monitor for Group Member Tracking

Monitor integrates sensors and a GPS tracker with wireless communications system that sends each user's data to other group members. Received data shows on a touch-screen interface. For use in outdoor recreation, by military groups, or at hazardous job sites in large work areas. (Table #46, Engineering I Atrium)

Super-Doubler: Play Old Video Games Again

Video scaling box that serves as an intermediary between older, no-longer-supported video devices (ex: old video game consoles) and modern displays. Improves picture quality and has more convenient connection options than what most displays use today. Provides a low-cost, easy-to-use option for those who want to enjoy old game systems. (Table #47, Engineering I Atrium)

Dibs LightLinks

Helps users find their way around the house at night while others are sleeping. System provides a low-level lighted pathway with motion sensors that light up when someone walks by the path. Could be used as a night light. Pathway colors can be chosen. System also has a security feature: it notifies the user of unexpected movements via smartphone app. (Table #48, Engineering I Atrium)

Essence of Music

Creates an LED representation of the sounds that can be customized by the user. User can change how the music is displayed through the use of lights. (Table #49, Engineering I Atrium)

Dancing Water Display: An Audiovisual Spectrum Analyzer

Project combines the concepts of water speakers (already on the market), and a spectrum analyzer, styled as a histogram based on a water pump array according to the frequency of the audio input. LEDs will flash to the beat of music. Bluetooth technology allows users to control LED and water pump settings with phones via a mobile application. (Table #50, Engineering I Atrium)

MECHANICAL & AEROSPACE ENGINEERING

58 Projects, 290 Senior Design Students

Improved Heart Monitor Wire Cleaning Process (Brevard Achievement Center)

To improve a process employed by physically or mentally challenged workers at BAC tasked with manually cleaning heart monitor wires. Project increases productivity with a rotary power tool with safety controls, and a fluid cleaning system with ultrasonic bath. (Table #1, Idea Lab)

Mini-Golf Sensor, Wishing Well Redesign for Give Kids The World

First project is a new sensor system for a mini-golf course to trigger animatronics when ball falls in cup. Second project is to create a larger wishing well for GKTW with a silent, optical sensor to improve entertainment experience for children.
(Table #1 and #2, Engineering II Atrium)

Powered Ring Crimping Tool

Improved way to crimp 9 gauge Hog rings for large animal enclosure construction. Project offers a solution to alleviate short-term user fatigue and potential long-term injury. Uses pneumatic power converted via a slot mechanism. Designed based on needs of Forest Animal Rescue. (Table #2, Idea Lab)

Automatic Doors for City of Orlando

Automated system for controlling 62 heavy-duty garage doors at a maintenance facility. Doors are accessible wirelessly; via a button at a local control station; and manually in the event of power loss. Project aims to improve traffic flow and efficiency. (Joint project with Computer Science team listed on page 12 to automate and control the hardware built by the mechanical team.)
(Table #3, Engineering II Atrium)

Solar-Powered Water Well Pump

Custom-made for a monastery, the pump is a retrofit of the current water well pump to provide a renewable energy power source. It's less expensive than current systems available. (Table #3, Idea Lab)

Smart Walker System for the Elderly

System is designed to help elderly people who use walkers use correct posture and improve walking stability to reduce chance of injuries. Project has sensors to measure pressure put on the walker, and sensors to detect the proximity of the user to the walker. Feedback techniques include tactile, auditory and visual responses to reiterate accurate practice. Compatible with standard walkers with pegged legs, two wheels or rollators. Intuitive to use with user-friendly features. No prior training required. Design requires little to no maintenance.
(Table #4, Idea Lab)

Automatic Lights for City of Orlando

Lower power, high lumens output LED light fixtures. Design includes automated collision prevention, adjustable height that is manually controlled, and wireless control application.
(Table #4, Engineering II Atrium)

Air Conditioning System for Piper Aircraft

New, more efficient AC system for Piper's top-of-the-line aircraft. Project is an electric system (vs belt-driven system connected to engine) that can be powered before passengers enter aircraft.
(Table #5, Engineering II Atrium)

Space-Launched Autonomous Glider

Cost-effective micro glider capable of versatile sensing, to be used by research scientists. Represents an improvement on previous military projects and weather balloon methodologies.
(Table #5, Idea Lab)

Periphyton Water Garden for City of Orlando

An upgrade of the water treatment system at Lake Wade Park: a fountain that serves as a filtration system to increase efficiency and prevent algae bloom. Project uses Phosphorus Sorbing Materials (sand, iron, calcium, other minerals) placed in base of original fountain. Saturated PSMs can be removed easily and used as fertilizer.
(Table #6, Engineering II Atrium)

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Foldable Origami Lightweight Deployable Solar Array Team (FOLDSAT)

Project aims to solve a problem in space: gathering solar power, which is limited because the power production of solar arrays depends on surface area of solar panel. This project is an easily foldable and deployable solar array that would offer more power than other solutions, and is cost-effective. Implements the art of origami to decrease payload size. (Table #6, Idea Lab)

SpaceX Hyperloop: Seating Apparatus

Designed for the Hyperloop transportation system, this comfortable, luxurious seat includes a user-friendly restraining system that secures passengers safely in an emergency stop. Design conforms to SpaceX's Hyperloop pod specs: max height 3.61 feet and max width 4.43 feet, to fit within a pod of two rows of 14. (Table #7, Engineering II Atrium)

CanSAT Atmospheric Observance Glider

Can collect temperature, pressure and photographs as it travels. Sensory package can be interchanged depending on mission and type of data to be gathered. Team has created a compact design with readily available materials to offer a low-cost method of observing a large area. Applications include planetary exploration. (Table #8, Idea Lab)

Gap Spanner Boom for Asteroid Redirect Mission (NASA Design Challenge)

A step on NASA's journey to Mars is to retrieve a boulder from an asteroid and return it to orbit around the Moon, and then crew members will visit the asteroid to return samples to Earth. For the crew members to get to the asteroid, they need to traverse across a gap between the Orion vehicle and the Asteroid Redirect Vehicle. This boom is for astronauts to traverse the gap. Design accounts for preventing damage to Orion's delicate thermal protection tiles. (Table #8, Engineering II Atrium)

SpaceX Hyperloop: Emergency Protocol Safety Stop (Team Podbrakers)

Mechanical brake using high-pressure buildup to rapidly decelerate high-speed Hyperloop capsules in a precise manner. Design accounts for minimizing potential tube damage. Specifically designed for unique specs of SpaceX Hyperloop while using existing technology to keep costs to a minimum. (Table #9, Engineering II Atrium)

Knight Vision Quick-Deploy Autonomous Surveillance Drone

Deployable drone platform with folding wings to allow for placement in a tubular structure and carried as a payload on a larger drone or to be dropped from a plane. Applications include military use or weather research. (Table #9, Idea Lab)

Human-Powered Vehicle Challenge

Team aims to produce efficient human-powered vehicle to enter in national American Society of Mechanical Engineers competition May 12-15. Roll cage is different than past UCF designs. Carbon fiber fairing will encapsulate the frame. Wheels are fully enclosed. (Table #10, Engineering II Atrium)

Small Satellite Pulsed Plasma Thruster

This project seeks to improve Pulsed Plasma Thrusters: electrical space propulsion systems using Teflon as the propellant. Team will explore the use of materials other than Teflon, and will alternate densities, electrical conductivity, sublimation temperature and various other properties. (Table #10, Idea Lab)

ASHRAE Design Calculations Competition Team

Optimizes the heating, ventilation and air conditioning systems for a two-story municipal building in Beijing, China. Project demonstrates compliance with latest editions of ASHRAE Standards 55, 62.1 and 90.1. Design also complies with Owner's Project Requirements. (Table #11, Engineering II Atrium)

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ASHRAE Systems Selection Competition Team

Focuses on a new, two-story municipal building in Beijing, China. Project uses life-cycle cost process to select the most suitable HVAC system and incorporates sustainability process promoted by ASHRAE standards and regulations.
(Table #12, Engineering II Atrium)

ASHRAE Integrated Sustainable Building Design Competition Team

Multi-purpose building is designed with pricing, floorplan and functional requirements specified by buyer. Building has offices, classrooms and separate dispatch center with garage and sleeping quarters. Project employs advanced energy modeling. Team has selected the most appropriate HVAC systems, structural materials and energy conservation measures within budget to maximize energy and water efficiency. (Table #13, Engineering II Atrium)

Kangaroo: Storage System for Bicycle Riding

The Kangaroo Transportation system provides a place for bicycle riders to store their belongings while they ride. Has a seat and wheels, attaches to bicycle. (Table #14, Engineering II Atrium)

Nail Polish Mixing System

Mixes different base colors to create more than 800 custom colors. Concept can be a small retail version or scaled up as a kiosk version. No similar product on the market exists now.
(Table #15, Engineering II Atrium)

Surgical Tool for Spinal Implants

This tool allows a spinal surgeon to shorten the implant rod while it is being implanted. It grinds away excess material at the end of the rod while simultaneously containing debris and safely flushing it out of the patient's body. Project sponsored by orthopedic surgeon Raymond Knapp.
(Table #16, Engineering II Atrium)

NASA Regolith Robotic Sensor for Space Rovers

A cost-effective solution to measure lunar soil (regolith) mechanics & properties such as soil density, cohesion, internal friction. This penetrometer (measuring tool that penetrates the soil with a rod, weight and cone) will work via Wi-Fi through a computer. It will probe soil with computer commands. Similar product costs millions of dollars; this project aims to cost less than $20,000 to build and maintain. (Table #17, Engineering II Atrium)

3-Axis Gyro Stabilization Platform

Mechanical cube able to animate itself without external force or assistance to maintain a balanced state. Provides stabilization in perilous terrain. Cube generates internal momentum and stabilization using a 3-axis flywheel and braking system that generates proper torque to keep cube in stable position. Employs control algorithms and communicates wirelessly with a mobile device. Useful for space exploration endeavors such as asteroid navigation. (Joint project with a Computer Science team listed on page 13.)
(Table #18, Engineering II Atrium)

Optical Visualization for Combustion Chamber

Allows researchers to see combustion inside a porous media combustion chamber at UCF used to study fuel efficiency and emissions treatment. Visualization enables quantitative and qualitative descriptions of the flame characteristics inside the chamber. (Table #19, Engineering II Atrium)

AIAA Design, Build, Fly Competition

Team is tasked with designing two aircraft. Aircraft #1 carries a two-pound payload; aircraft #2 carries the first aircraft. Aircraft #1 can be broken down into parts but UCF team has kept it one piece to maximize score. Winning team will have best written paper and best performing aircraft.
(Table #20, Engineering II Atrium)

Hybrid Motor Rocket Competition: Maximum Altitude (FSGC Competition)

Team aims to optimize all rocket subsystems to launch a hybrid rocket as high as possible. Strategies include minimizing rocket mass and other methods to ensure stability and fuel performance. Employs intricate 3D-printed parts to minimize drag and weight simultaneously.
(Table #21, Engineering II Atrium)

Floatovoltaics: Floating Solar Farm

Team has designed and launched a 5-kilowatt floating solar array system. The 20-panel proof-of-concept floats on a base made of high-density polyethylene, a common and durable plastic. Anchored with steel cabling and chains at the pond banks, the system is intended to conserve land and help meet UCF's goal to be climate neutral by 2050. If future tests of the prototype are successful, including distributing the generated power to the campus grid, UCF may scale it up to a 900 kw system to fully offset the energy consumed by Bright House Networks Stadium.
(Table #22, Engineering II Atrium)

High-Speed Fixed Wing Vertical TakeOff and Landing (VTOL) Autonomous AUV

Improves upon standard quadcopters which are slow and inefficient compared to winged vehicles; and adds the capability of a winged vehicle landing vertically. Allows for greater range and lower per-square-mile cost. Vehicle can deliver payloads to and from small spaces, and faster than any other vehicle on the market.
(Table #23, Engineering II Atrium)

Lifting Legs Stilts

Intended for use in the construction industry, these stilts can adjust height from ground level to 36 inches. Allows workers to be more mobile on job sites as an alternative to using a ladder.
(Table #24, Engineering II Atrium)

Hybrid Rocket with 3D-Printed Parts

Integrates 3D printing in design of the fuel and body of a hybrid rocket for better energetic and mechanical performance than conventionally constructed rockets.
(Table #32, Engineering II Atrium)

Team H20 Drone

Goal is to provide a more cost effective alternative to the current small submersible drones on the market. Wireless drone is attached to a buoy on top of the water, and has antennas to communicate with the drone controller on land. Solar panel allows charging while in the water.
(Table #25, Engineering II Atrium)

Raven Surgical Robot Support System Design

Intended to improve the support structure of the Raven Surgical Robot in UCF's Medical Robotics Laboratory. The current support structure creates some limitations. For example, the current frame limits the space where surgeries can be performed. This design can attach to an operating table that allows to test the robot in its optimal environment.
(Table #26, Engineering II Atrium)

Steam Treatment of Citrus Trees

Project uses a tent cover with inside sensors to prevent spread of tree-killing disease and help prevent citrus industry's significant financial loss due to crop loss. (Table #27, Engineering II Atrium)

SimRacerX: Motion Racing Simulator

Simulator allows users to experience the thrills of car racing without the high cost, time, travel, maintenance and exhaustion involved in live racing. Cockpit's fiberglass racing seat has a 5-point racing harness and full user control interface including steering wheel, 6 speed H-pattern shifter, pedal assembly with clutch, and a 32" LCD display. Simulator will pitch, roll and yaw with a 40-degree range of motion and realistic response time. Intended for avid race car drivers. On display is a scaled-down prototype.
(Table #28, Engineering II Atrium)

G-Lab: Artificial Gravity Space Laboratory

Will operate on lower Earth orbit, below and behind the International Space Station. Project will consist of two main modules at opposite ends of the station that will be attached by an expandable truss system, and a middle module that serves as a docking station. (Table #29, Engineering II Atrium)

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Limbitless Eco-Leg Design

An affordable lower leg replacement for children in underdeveloped countries. Device attaches to the child's residual limb and functions as the remainder of the leg and foot. Design is lightweight, maintains natural human walking and employs 3D-printed parts. Can be adjusted to accommodate child's growth. (Table #30, Engineering II Atrium)

Golf Ball Retrieval System

Project involves a camera placed on currently available ball retriever to allow user to view and easily locate submerged balls that maybe hard to see in sediment. Underwater image is displayed on a screen near the handle of the ball retriever. Concept can be used to locate lost items in other bodies of water (at marinas, swimming pools, etc.) (Table #31, Engineering II Atrium)

Stabilizer for Slow Crack Growth in Ceramics Testing

Enables researchers to hold a specimen during static fatigue testing of ceramic materials. Acts as a stabilizer, and is designed to work around the bending geometry of the specimen to control the crack stability, therefore reducing the chance of catastrophic propagation that may occur from testing crack resistance. Custom fits current lab machine at UCF. (Table #33, Engineering II Atrium)

Redevelopment of the V-Notch Automatic Cutting Machine

Project is a machine designed to reduce vibrations when cutting ceramic pieces. Cuts V-Notches into ceramic pieces with a tip radius of 10 micrometers or less. (Table #34, Engineering II Atrium)

In-Situ Compression Loading Device

Enables research on ceramic materials under high compressive stresses, and designed to integrate with existing equipment. Device consists of a housing that encases power transmission components that assist in compressing a sample of ceramic material. Has the unique capability to be mounted on the stage of a microscope. (Table #35, Engineering II Atrium)

Reusable Entry Vehicle for Suborbital Science

Small-scale probe that collects data across a wide range of altitudes in the Earth's atmosphere. Project provides a more cost-efficient and effective method of atmospheric data collection. (Table #36, Engineering II Atrium)

NASA Mars Ascent Vehicle, University Student Launch

A launch vehicle and payload bay integration mechanism to help NASA potentially bring back samples from Mars. Project will properly secure the payload and reach a max altitude of 1 mile. Launch vehicle is designed to be recoverable and relaunched. Small scale and full scale models will be flown and tested before the student competition. (Table #37, Engineering II Atrium)

Automated Outrigger System for Fishing Boats

Typical fishing outriggers deploy manually which can be tricky, time consuming and dangerous. This project completely automates the process of feeding the rigging line in and out of the vessel. Sponsored by RUPP Marine. (Table #38, Engineering II Atrium)

Fixed Wing Air Injector

Team aims to reduce the chances of aircraft stall during flight. Device intakes air and redistributes it over the upper surface of each wing of the aircraft. Can potentially reduce takeoff distance and increase fuel efficiency in certain aircraft. (Table #39, Engineering II Atrium)

Multi-Purposed Fixed Wing UAV

Unmanned aerial aircraft can fly up to 8 hours at altitudes greater than 10,000 feet above sea level, and at velocity of 30 - 80 knots while carrying up to a 12-pound payload. Can be easily assembled/disassembled without tools. Can be used for fire prevention, agricultural surveys or assist in natural disaster relief. (Table #40, Engineering I Atrium)

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A Flying Wing: Blended Wing Lifting Body

An aircraft with no distinct wing and fuselage section: essentially a flying wing. Designed to carry up to a 5-pound payload for at least 20 minutes with a wingspan of 6 feet. To be showcased is a 6-foot by 4.5 foot aircraft that weighs no more than 20 pounds. Larger scaled versions could have commercial and military applications.
(Table #41, Engineering I Atrium)

Micro Aerial Vehicle with Pressure Sensors

Takes pressure readings from wings. Improves current way of taking pressure readings to stabilize an aircraft by using pressure differences rather than inertial forces to allow the stability control system on board to react significantly sooner to keep the aircraft stable. Sponsored by the Air Force.
(Table #42, Engineering I Atrium)

Highly Adaptable Roving Platform (HARP)

Terrestrial rover capable of carrying a wide range of payloads while traveling on simulated terrains (lunar, Mars). Modular design allows for design features to be customized depending on needs of customer. Sponsors: Florida Space Grant Consortium, Florida Space Institute, NASA.
(Table #43, Outside Engineering II)

Project Horizon: Where Sky Meets the Sea

Remote controlled vehicle that flies and swims and dives while carrying camera and/or sensors. Many current versions created by military have limitations, such as an inability to fly after being submerged. Uses a multi-rotor copter with a separate, submergible tethered to the multi-rotor that detaches to allow for wireless control by the operator and efficient underwater travel.
(Table #44, Outside Engineering II)

Remote-Controlled Balloon

Remote-controlled small blimp with a flight time of about 45 minutes. A small camera takes video. The low-cost and long flight time can be beneficial in sports journalism. (Table #45, Outside Engineering II)

Baja Off-Road Suspension System

Front and rear suspension systems to improve the maneuverability of the Baja Society of Automotive Engineers vehicle. Key aspects include the low camber change in the front during roll, allowing front end to stay planted while turning and minimal camber change in the rear during bump to maximize traction during articulation.
(Table #46, Outside Engineering II)

Naturally Ventilated Laboratory for Infection Control in Healthcare Settings

Intended for use in developing countries, this lab provides diagnostic services in areas with high tuberculosis and HIV rates. Uses alternative electrical energy sources (solar, battery, wind) and requires minimal maintenance. Showcased lab will be in a 40’ x 8’ x 9’6” shipping container and available for walk-throughs. Sponsors: Germfree Laboratories and the CDC
(Table #47, Outside Engineering II)

Icarus’ Redemption: Rigid Winged Amphibious Hang Glider

Allows user to takeoff from the water while being towed from a boat, eliminating the need for a hang glider pilot to takeoff from the top of a hill.
(Table #48, Outside Engineering II)

Sound Damping for Piper Aircraft

Inflatable door seal to quiet a current series of Piper aircraft, to improve pilot flight experience, and increase comfort by reducing noise.
(Table #49, Outside Engineering II)

Radius X: Efficient Engine Design

Alternative design of client’s patented engine that is more efficient than internal combustion engine. Design uses a significantly bigger “moment arm” attached to the outermost part of the spinning outer ring to the center driveshaft. Capable of producing high torque from low revolutions per minute (vs. high RPMs that internal combustion engines require.)
(Table #50, Outside Engineering II)

COMPUTER SCIENCE

17 Projects, 58 Senior Design Students

Real-Time Dehazing Video Analyzer

Removes hazing due to weather from a video feed in real time. For use in computer vision applications. Program dehazes images and sends to another program for analysis. (Table #1, HEC 101)

Big Data Management Tools

Project aims to combine several different tools for "Hadoop" that collect and analyze data on a massive scale. Separately, they are sparsely organized and difficult to use. Project will combine into a single interface and provide a service so that anyone can install tools easily. (Table #2, HEC 101)

Hydration and Physical Activity Intervention – HAPI – App

For use with elderly cancer patients that will notify the user after a certain time interval to be active, get hydrated, etc. User can record their activity and what they consumed as a way to track recovery. Older patients tend to need more reminding than younger ones. Project has a website to allow nurses to view patient progress. Proposed by a researcher in the UCF College of Nursing. (Table #3, HEC 101)

Automatic Doors & Lights for City of Orlando

Automated system for controlling 62 heavy-duty garage doors at a maintenance facility. Doors are accessible wirelessly; via a button at a local control station; and manually in the event of power loss. Project aims to improve traffic flow and efficiency. (Joint project with Mechanical and Aerospace Engineering team listed on page 6 to automate and control the hardware built by the mechanical engineering team.)
(Table #3 & #4, Engineering II Atrium)

3D-CytoFlow: Three-Dimensional Flow Cytometry

A web application for professional pathologists to simplify in a 3-D interactive render data retrieved from flow cytometers. (Table #4, HEC 101)

Cognitive Resource Solutions

A mobile application for therapists to ultimately improve current Cognitive Rehabilitation Therapy practices, which mostly use books to facilitate activities. System runs on an iPad or Tablet, has an interactive website and connects to a database running on a remote server. (Table #5, HEC 101)

CD9: Teenager Monitoring System for Parents

Android application dynamically creates alerts based on a teenager's behavior and reports them via a web-based dashboard to parent and the teen, including alerts. Resources from a Knowledge Base will inform teens and parents about the dangers of the behaviors, how to handle online and real-life situations, and how to communicate about the issues CD9 has detected. Serves as a "handshake" agreement between teens and parents that they will be monitored and receive alerts. (Table #6, HEC 101)

CogniStudy

High school students can prepare for the SAT and ACT in a fun and social way. Offers social interactivity, tutor support, progress tracking and entertainment, a combination of features that does not exist in current test prep methods. Students can use Android application to play against a friend, a random opponent or a computer; message each other; view analytics; and gain power-ups and achievements. Tutors can use the Web application to submit and review new questions, interact with students and view analytics on students' progress. (Table #15, HEC 101)

Nautilus

A simulator that simulates the expected behavior of a robotic submarine in water. For use by people who build robotic submarines and the artificial intelligence control for the robots. The effect of light on water will also be simulated to produce output images that the submarine cameras would capture in real life to allow users to test computer vision programs. Intended to be an open source project. (Table #39, Outside HEC)

Catalyst
Uses artificial intelligence patterns to create a dynamic experience for video game players. Will save time in game development process while reducing the amount of work needed to produce a game. Employs genetic algorithms, procedural content and evolutionary-based factors that players will be exposed to, such as gameplay, story and level design. (Table #17, HEC 101)

3-Axis Gyro Stabilization Platform
Mechanical cube able to animate itself without external force or assistance to maintain a balanced state. Provides stabilization in perilous terrain. Cube generates internal momentum and stabilization using a 3-axis flywheel and braking system that generates proper torque to keep cube in stable position. Employs control algorithms and communicates wirelessly with a mobile device. Useful for space exploration endeavors such as asteroid navigation. (Joint project with a Mechanical & Aerospace Engineering team listed on page 8.)
(Table #18, Engineering II Atrium)

SFI Properties
A redesign of Software First's Property Management application to improve user experience and increase productivity. Team has developed a new web application and an Android application for mobile devices. (Table #18, HEC 101)

Glossasim: Using Virtual Reality to Reduce Fear of Public Speaking
A virtual reality simulation to help those who suffer from glossophobia, the fear of public speaking. System uses the Oculus Rift headset to put users in simulated public speaking scenarios and prepares users for presenting. Users will receive feedback on their presentations so they can improve their skills. Users can also invite friends to watch their virtual presentations. (Table #19, HEC 101)

Recyclist
Website and mobile application that provides assistance to the general public for accessing community information about resource recycling, service providers. Will also inform businesses for buying and selling resources such as overstocked products, hazardous waste and byproduct materials. Businesses can create user profiles with a secure login that allows them to advertise, create and search product listings. (Table #20, HEC 101)

Open Memory Database
An in-memory, fast and multiprocessor-friendly database that satisfies various safety and efficiency characteristics that most commercial databases do not, such as being wait-free and non-blocking. This is a first-of-its kind full database system that is wait-free throughout its execution. (Table #21, HEC 101)

Joust Analytics: Full Flight Aviation Big Data
A user-friendly intuitive tool to analyze data that is processed using high-level algorithms, and convert it into human-readable, useful data. Web-based graphical user interface has a dashboard and allows users to read data in understandable way. Aids in monitoring health and status of airline fleet.
(Table #22, HEC 101)

Finding Bodies with GOOL: Grave Operating Object Locator
Smartphone-based system that sends electromagnetic signals into the ground and reads the signal to determine the presence of a body or casket. For use by graveyard owners, crime scene investigators, or genealogists. System costs less than $100; whereas typical ground penetrating radar (GPR) costs more than $15,000. Project replaces "grave dowsing," a superstitious technique to locate burial sites when cemetery records are unreliable; or disturbing graves which is considered taboo. (Joint project w Electrical & Computer Engineering team listed on page 4.)
(Table #42, Outside HEC)

INDUSTRIAL ENGINEERING & MANAGEMENT SYSTEMS

12 Projects, 60 Senior Design Students

Surface-Mount Technology Process Assessment and Optimization

Team will analyze the process, identify inefficiencies and develop actions to optimize operations of SMT technology used on client's circuit board assembly lines. Goal is for Melbourne, Florida-based client MC Assembly to produce products at a steadier, more efficient rate. (Table #1, Engineering 1 Study Area)

Atrium Experience/Check-In DFSS (Design for Six Sigma)

Team is designing a process to improve patient flow through the atrium and check-in process for a healthcare client to ultimately create a new consumer-centric process that meets current and future demands.
(Table #2, Engineering 1 Study Area)

Additive Manufacturing Cost Model for Lockheed Martin

Team has produced a detailed cost model for additive manufacturing (3D printing) as applicable in defense products manufacturing. Model will identify and consider totality of additive manufacturing part costs including machine costs, labor, and post-processing; and will be used across various platforms to compare injection molding vs. additive manufacturing.
(Table #3, Engineering 1 Study Area)

MC Assembly: Inventory Management

To improve an inventory pulling system to increase production rate and quality of the items produced by MC Assembly. Team has developed a redesign of the inventory holding facility and surrounding policies to reduce the time needed in accurate inventory selection.
(Table #4, Engineering 1 Study Area)

Modern American Manufacturing Project

Team to review current processes, conduct vendor analysis, establish maximized efficiency model, examine product components, calculate percentages of maximum sustained production for profitability, and generate a detailed growth plan for PBM Specialties. The company creates customized lighting, signage and other products and seeks to obtain a contract with The Walt Disney Company to sell a new customizable specialty lamp.
(Table #5, Engineering 1 Study Area)

Throughput Increase for Florida Hospital Radiology

Team is focusing reducing the wait time of patients who enter Radiology Dept. from the Emergency Dept. (Table #6, Engineering 1 Study Area)

Improving Patient Flow in Florida Hospital Emergency Department

Team is tasked with conducting a flow analysis of ED physicians and nurses to identify constraints in workflow preventing patients from leaving ED timely. Team will provide a list of barriers preventing physicians and nurses to providing timely care; and offer simple solutions to address the findings.
(Table #7, Engineering 1 Study Area)

Revology Cars Manufacturing Process Optimization

Company builds customized 1964-1966 Ford Mustang replicas that have modern features yet retain classic look. This team's goal was to reduce manufacturing error rates at each work station by developing a detailed task list for each work station; and to increase organization by creating an inventory database for the company.
(Table #8, Engineering 1 Study Area)

INDUSTRIAL ENGINEERING & MANAGEMENT SYSTEMS

12 Projects, 60 Senior Design Students

United Launch Alliance ASOC Tool: Material Distribution and Storage Optimization

Team goal is to reduce the lost time of the workers and increase the availability and accessibility of tools required to complete daily tasks. By reducing employee lost time the launch lead times can be minimized from 45 days to 15 days.
(Table #9, Engineering 1 Study Area)

MC Assembly

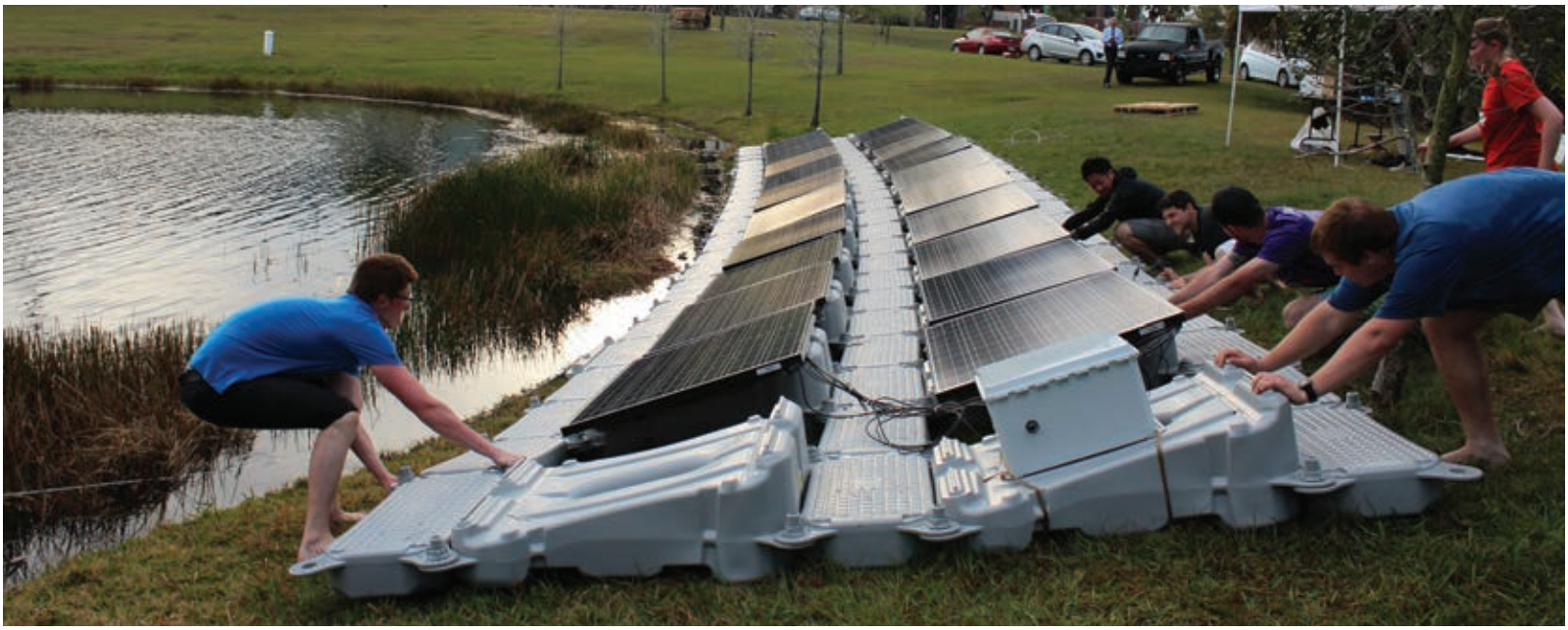
For a company that hand-assembles and solders small orders of circuit boards. The UCF team will help identify sources of defects in the Post-Wave Assembly process, produce value stream mapping of the facility, and optimize the floor layout. Team recommends that the company implement certain ergonomic measures to reduce employee error; change its facility layout; and implement process mapping measures.
(Table #10, Engineering 1 Study Area)

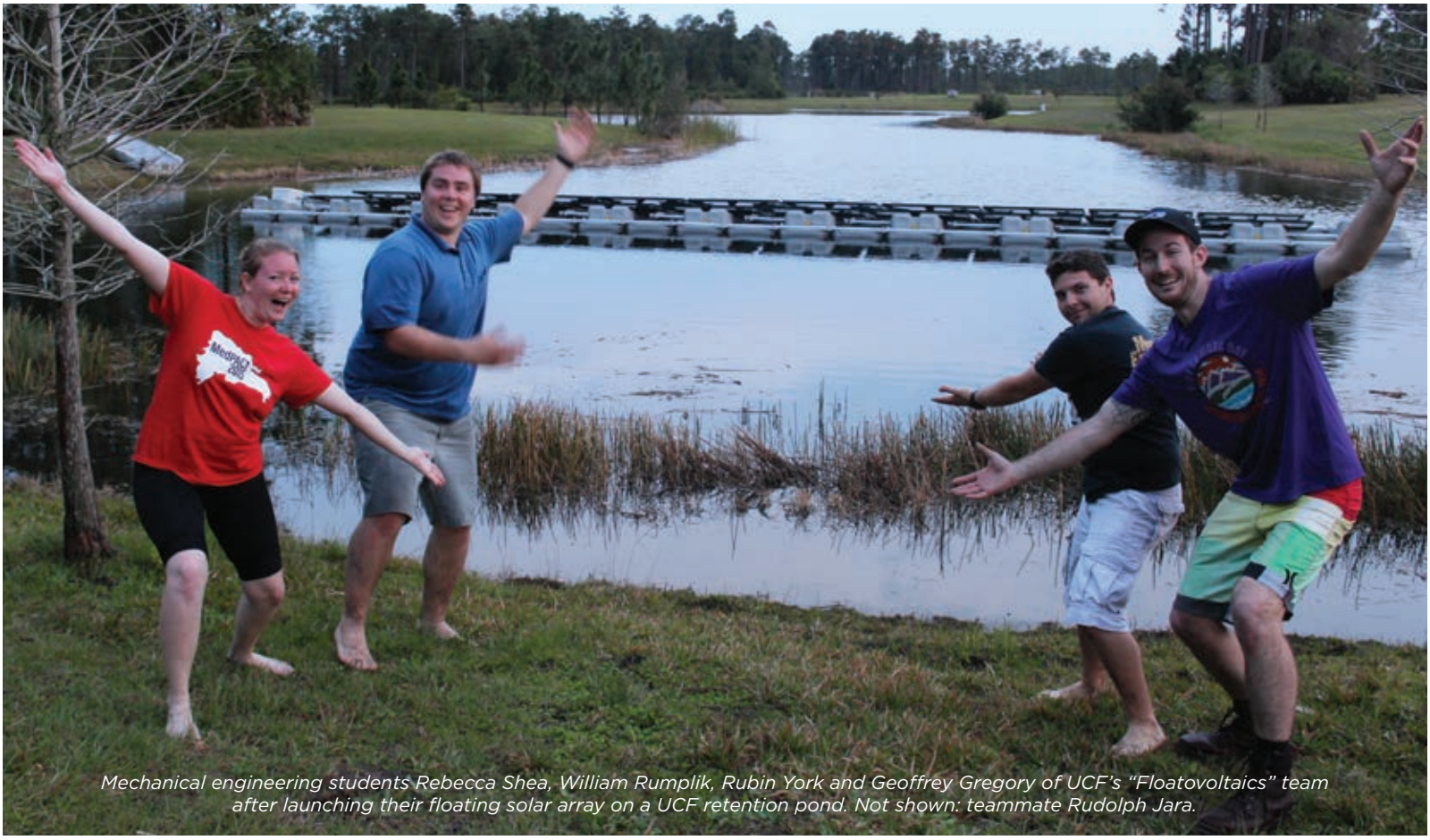
Cable Wake Park Throughput and Revenue Generation Capacity Study

Goal is to determine capacity and throughput of two cable courses. Team will find opportunities for the company to increase revenue by developing an interactive Excel tool.
(Table #11, Engineering 1 Study Area)

Boston Whaler Kit Cart Design

Currently employees are using bakers' racks to transport parts from the warehouse to the assembly floor and also house the parts while on assembly floor. Parts don't fit well on bakers' racks due to various shapes and sizes, which leads to potential damage of parts. Team will design an ideal cart.
(Table #12, Engineering 1 Study Area)





Mechanical engineering students Rebecca Shea, William Rumplik, Rubin York and Geoffrey Gregory of UCF's "Floatovoltaics" team after launching their floating solar array on a UCF retention pond. Not shown: teammate Rudolph Jara.

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