ECE

FLORIDA

Department of Electrical & Computer Engineering

ECE is Everywhere!

SPECIAL ISSUE: ECE is Everywhere!
From nanoscale devices to cell phones...from bioelectonics to secure computing...from robots to airplanes...from the power grid to the internet.
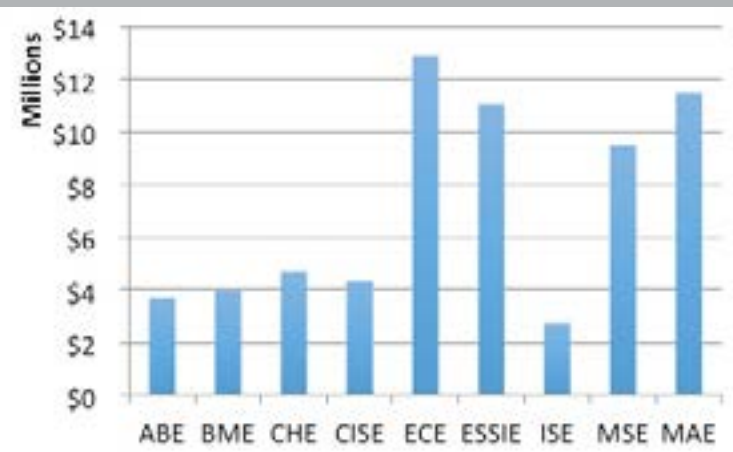
UNIVERSITY *of* **FLORIDA**

ECE is Everywhere!

In This Issue

ECE led the college in research expenditures in Fiscal Year 2013-2014 with $12.9M. Total college expenditures were $64.3M.

PROUD TO BE PART OF GATOR ENGINEERING

Dr. John Harris,
Department Chair

Layout & Design, Editing
Sara Schaffer

Contributors
Dr. John Harris

Photo Credits
Sara Schaffer, Eric Zamora,
Eric Schwartz

ECE
FLORIDA
Department of Electrical & Computer Engineering

University of Florida
P.O. Box 116200
216 Larsen Hall
Gainesville, FL 32611-6200

www.ece.ufl.edu
[352]392-0911

ECE Florida is online, and we would like you to join our community.

Message from the Chair

ECE
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Welcome to our ECE newsletter, highlighting **ECE is Everywhere!**

The big news in our department is that we have hired six new faculty members since last year, four of these as a result of the university's preeminence initiative. This initiative is a part of a strategic investment from the Florida Legislature to boost the University of Florida to the top 10 public universities in the nation. These new positions are in the following areas: big data, cybersecurity, neuroengineering, power systems and power electronics. These areas match well with the areas that were targeted in our department strategic plan last fall.

Our first two preeminence hires have already arrived. **Dr. Karim Oweiss** was an associate professor at Michigan State University and specializes in brain machine interfaces. **Dr. Daniela Oliveira** was an assistant professor at Bowdoin College and specializes in computer security and operating systems. Two more preeminence hires will arrive in January of 2015. **Dr. Arturo Bretas** is a PhD graduate from Virgina Tech and specializes in power systems protection and the smart grid. **Dr. Shuo Wang** is also a graduate from Virginia Tech and joins us in power electronics, smart grid, renewable energy conversion and electrification of transport. We are still in the process of hiring our fifth preeminence line, the Intel Chair in Information Technology.

In addition, we have hired two otherfaculty members through other initiatives. **Dr. Sanjeev Koppal** is a Ph.D graduate of the Robotics Institute at Carnegie Mellon University. Dr. Koppal specializes in computational photography and computer vision. **Dr. Tuba Yavuz** is an expert in software engineering and concurrent systems. She is a Ph.D graduate from the University of California, Santa Barbara, who had previously been a research faculty member in the UF CISE Department.

Finally, we wish to welcome another faculty member joining our department in January—**Dr. W. Kent Fuchs**—the new president of the University of Florida. Dr. Fuchs earned his PhD in electrical engineering from Illinois in 1985. He has since served on the ECE faculty at Illinois, as ECE Department Chair at Purdue, as Dean of the College of Engineering at Cornell, and as Provost at Cornell. Dr. Fuchs is a leading researcher in computer engineering, particularly in areas of dependable computer systems and the testing/failure analysis of integrated circuits.

As is very fitting with our the "ECE is Everywhere" theme of this newsletter, we look forward to welcoming Dr. Fuchs as the next president of the University of Florida and as our newest ECE faculty member.

Best Regards,

John Harris

Professor and Chair

UF UNIVERSITY *of* FLORIDA

FACULTY FOCUS
ECE Florida Alum and Professor

What is Electrical Engineering?

DAVID ARNOLD

At 36 years of age, Dr. David P. Arnold is the youngest full professor in the ECE Department. He is also an alumnus of the department (BSEE 1999, BSCEE 1999, MSEE 2001). He earned his PhD at Georgia Tech in 2004 and came back to UF as a faculty member in 2005. Dr. Arnold's research focuses on magnetic thin/thick films and magnetic micro/nanostructures; magnetic microsystems and electromechanical transducers; and compact (<100 W) power/energy systems.

Dr. Arnold is an active participant in the magnetics and MEMS communities, serving on various conference organizing committees and journal editorial boards in in his research areas. His work has been recognized with several prestigious awards, including the 2008 Presidential Early Career Award in Science and Engineering (PECASE) and the 2009 DARPA Young Faculty Award. As an undergraduate, Dr. Arnold was selected to join the UF Chapter of Eta Kappa Nu (HKN), the Electrical Engineering Honor Society. Now as a faculty member, Dr. Arnold serves as HKN's faculty advisor. He is also a Senior Member of IEEE and a member of Tau Beta Pi.

Dr. Arnold is an enthusiastic and effective instructor. As seen in the photos below, he is teaching one of the flipped classrooms for Circuits 1 in Fall 2014. ECE has pioneered the flipped classroom approach in the college. The flipped classroom means that lectures are watched at home and problems are solved in class under the watchful eye of the professor. Studies have shown that students in Circuits 1 learn more and are less likely to drop the class with using this new approach.

Beyond his passion for research and teaching, he most enjoys spending time with his wife Jennifer (also an ECE alum) and their three children.

Instruction in a flipped classroom encourages student focussed interaction with faculty and peers resulting in greater student engagement and learning.

Electrical Engineering is a well-known and broad discipline but most definitions of electrical engineering found in dictionaries and on the web are antiquated and more appropriate for the 1950s than today. A better definition is: ***Electrical Engineering is a field of engineering that deals with the processing, transmission, and storage of energy or information using electromagnetics, electronic circuits and computers.*** Electrical Engineering includes the following eight key areas:

1. **Computers** have been a huge part of electrical engineering since our own graduate invented the digital computer (John Atanasoft UF BSEE 1925). ECE faculty are world leaders in many computer areas including cloud computing; big data; cyber-security; embedded computers; reconfigurable computing; cyber-physical systems; high-performance computer architectures and computing; operating systems; performance analysis; parallel and distributed computing; networking; fault-tolerant computing; real-time systems; and the internet. Computers are also tools that have transformed the remaining areas of electrical engineering.

ECE is everywhere, including designing the next generation of smartphones, developing robotic surgeons, engineering the next spacecraft to land on a comet.

2. **Signal Processing** includes traditional topics in RADAR; image, video, audio, and speech coding and processing; wireless communications; GPS; natural language processing, pattern recognition, computer vision, adaptive signal processing, information theory, machine learning, medical image processing, neuro-engineering, nonlinear dynamical systems, and phased array signal processing. At UF, signal processing faculty also study brain-machine interfaces and brain-inspired computation.

3. **Controls** covers automobile cruise control systems and other vehicular controls; medical equipment such as pacemakers and ventilators; autonomous vehicles; and aerospace control systems. At UF, recent work by ECE controls faculty includes sophisticated models of brain function and the smart electrical grid that automatically schedules electricity while integrating solar and other renewable energy sources.

4. **Communications** concerns systems ranging from traditional radio and TV broadcast to more modern mobile communications with cell phones, Wi-Fi and Bluetooth. UF faculty research includes multimedia transmission over wireless channels, channel-quality estimation, spread spectrum communications, signal coding, computer networks, fiber optics and satellite communications.

5. **Electronics** covers a broad range of topics from the manufacturing of integrated circuits to their applications in real-world systems. Topics include analog and digital chip design; medical instrumentation; high performance graphics hardware; low-power electronics for handheld appliances; RF/microwave/millimeter-wave electronics; data converters; biomedical circuits; power electronics; IC test; and wireless communication circuits.

ECE is Everywhere!

6. **Devices** focuses on the behavior, fabrication, and design of novel devices. It is the area most responsible for the microelectronics revolution that continues to change the world. Research topics include transistors and other electronic components, semiconductors, micro-electromechanical systems (MEMS), optoelectronics, microsensors, quantum devices, nanotechnology, microactuators and transducers.

7. **Power** is fundamental to the operation of the modern world. This area includes power generation and distribution; the electric grid; power system protection, analysis and restoration; power quality; distribution systems and reliability; hybrid and electric cars; renewable energy conversion and integration with the power grid; electrification of transportation; and compact power systems for small devices such as smart phones and implanted medical devices.

8. **Electromagnetics** concerns electromagnetic fields and their applications. Topics include radio and cell phone transmission; lasers; photonics and optics; lightning research; medical imaging modalities such as MRI or x-rays; electromagnetic interference; and the fundamental study of device operation and signal transmission.

The Electrical and Computer Engineering (ECE) Department offers two majors: Electrical Engineering and Computer Engineering (jointly managed with the CISE Department). In the last 20 years, the new field of Computer Engineering has grown in popularity. Computer Engineering is the study of the hardware and software of computers. It combines the computer-oriented side of Electrical Engineering with the addition of traditional Computer Science topics such as operating systems, compilers and data structures.

ECE is growing even in nontraditional areas. For instance, automobiles are becoming more and more "electrified" with time. Of course, hybrid and electric cars rely on complex battery systems and electric motors but the electrification goes much further than that. New car models include sophisticated sensors, control systems, navigation systems and dozens of embedded microprocessors. The newest models integrate laser sensors, RADAR, cameras and other sensors to provide adaptive cruise control, road condition monitoring and collision avoidance systems. Fully autonomous vehicles are right around the corner. All of these require ECE.

The outlook is bright for jobs in ECE. Many ECE graduates are hired by traditional ECE companies such as Texas Instruments, IBM, Intel, Apple, Qualcomm, and Harris Corporation but there is also a huge demand for ECE graduates among newer companies such as Google, SpaceX and Tesla. Companies like ECE grads for their problem solving abilities, quantitative skills and high-tech savvy. Many electrical and computer engineers become doctors, lawyers, managers or go on to start their own companies.

According to a recent study, ECE graduates have the highest starting salaries of all majors (Business Insider, November 2014). See graphic on the right for the top ten paying majors.

ECE FLORIDA MATRIX

EE CORE	APPLICATIONS				
	Biomedical	Smart Energy	Robotics	Automobiles	Cloud Computing
Computer	●	●	●	●	●
Signal Processing	●	●	●	●	●
Controls	●	●	●	●	·
Communications	●	●	●	●	·
Electronics	●	●	●	●	●
Devices	●	●	●	●	·
Power	●	●	●	●	●
E&M and Optics	●	●	·	·	·

TOP 10 HIGHEST AVERAGE STARTING SALARIES

1. $57,030 Electrical Engineering
2. $56,576 Computer Engineering
3. $56,055 Mechanical Engineering
4. $54,183 Software Design
5. $54,065 Computer Programming
6. $53,622 Chemical Engineering
7. $52,237 Computer Science
8. $51,622 Civil Engineering
9. $47,952 Mathematics
10. $45,591 Construction

Chart based on information from: Business Insider November 2014

New EE CURRICULUM

OUR CURRICULUM IS EVOLVING WITH THE CHANGES OF OUR CULTURE AND GLOBAL NEEDS

This year our faculty have approved a major revision in our undergraduate EE curriculum. After much discussion with faculty, students, alumni, and employers, we decided to add more flexibility for the students to select course specializations that better fit their interests and career plans. The field of electrical engineering has grown so broad that it no longer made sense to require as many courses as we once did. With the added flexibility, the students are required to have breadth within electrical engineering, and also more depth than was previously required. We have also added a bioelectrical track where students can take courses in bioelectrical systems, neural engineering and bioformatics. A positive outcome of this change is that students generally do better in courses that they want to take instead of courses they are forced to take. The curriculum flowchart details the required and elective courses. The arrows indicate prerequisite constraints. The curriculum consists of 6 sets of courses:

Preparation: The "Preparation" courses are the math, science and programming courses that are required for EE majors and mostly the same as required for all engineering majors.

Introductory: The ECE department first sees EE majors when they take the "Introductory" courses of Circuits 1 (EEL3111C), Signals & Systems (EEL3135) and Digital Logic (EEL3701C). All three of these courses are 4-credit laboratory courses. Signals & Systems focuses on discrete-time systems only and includes a Matlab-driven laboratory. The final Introductory course, Intro to ECE (EEL 2000), is a two-credit, seminar-based course that discusses the EE profession as a whole and provides some experience with ethics, writing, Matlab and soldering of electronic components.

Foundational: The "Foundational" courses are the heart of Electrical Engineering. The primary change in our new curriculum—and the most controversial—is that we no longer require full-semester, dedicated courses in Electromagnetics, Solid State Physics or Electronics. Instead we have created a new required course "EE Physics" that covers the basics of these fields. Additional topics in Electronics are addressed through other required courses as well as in the capstone design sequence. The three foundational courses are EE Physics (EEL3008), Circuits 2 (EEL3112) and Microprocessor Applications (EEL3744C).

Breadth: EE majors must take at least three of the "Breadth" courses. The areas of these courses are roughly laid out from left to right starting with the more physics-oriented courses, followed by the more math/signals driven courses and finally the more computer-oriented courses. In this spectrum, EE fills the gap between physics (far left) and computer science (far right). Another major change in the curriculum is that all nine of these Breadth courses are 4-credit courses with included laboratories. These courses are meant to be hands-on, application driven courses.

Depth: EE students must take at least two "Depth" courses in two different areas. The Depth courses in each area are defined to be the courses that have that area's Breadth course as a prerequisite. Most of these courses are co-taught with first-year graduate courses in the same room. The graduate courses typically require additional questions on exams and additional homework assignments.

Other requirements: Additional courses, not shown, include 9 credits of technical breath (technical courses outside the department) and 17 credits of EE technical elective courses (within the department); general education and humanities courses. Finally, all EE students must take the capstone design sequence of EE Design1and EE Design 2 (or the two-course IPPD sequence). EE Design 1 can be taken after the student has taken all three Foundational courses and at least one Breadth Course. EE Design 2 is taken after a student completes EE Design 1 and at least one Depth course.
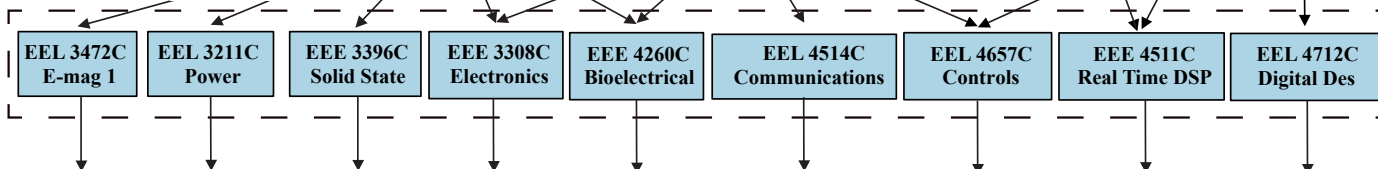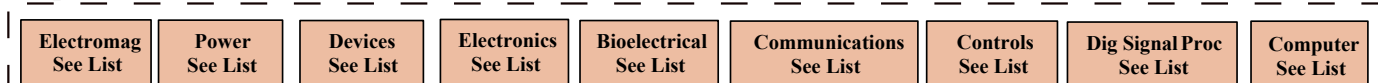

BSEE Curriculum flowchart
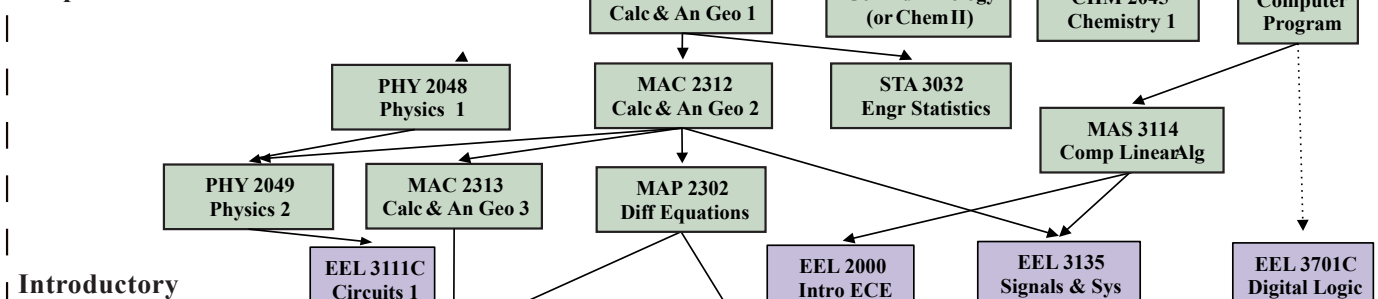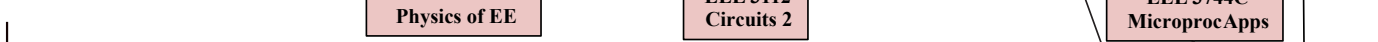
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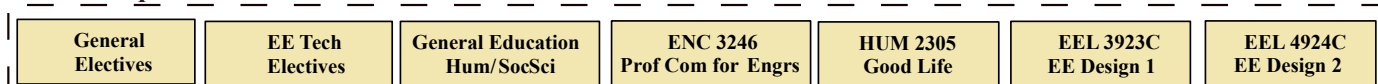
The University of Florida's Multi-functional Integrated System Technology (MIST) Center will play a leading role in researching the next generation of "smart" electronics funded by a National Science Foundation program that combines federal money with industry investments in strategic research.

The MIST Center is a collaborative center housed in the College of Engineering, with a partner site at the University of Central Florida. It is composed of an interdisciplinary team of faculty from the electrical, mechanical, biomedical, chemical and materials engineering departments. The center directors are Toshi Nishida and David Arnold, both professors in ECE Florida, Department of Electrical and Computer Engineering, and Jiann-Shiun (Peter) Yuan and Hyoung Jin (Joe) Cho, professors at UCF.

MIST CENTER
Multi-functional Integrated System Technology

As a designated Industry/University Cooperative Research Center, the MIST Center will receive over $880,000 from the NSF and upwards of $4 million from industry and government partners to help power the "Internet of Things."

In 2014, U.S. News & World Report ranked the University of Florida's department of Electrical and Computer Engineering as the 19th-best public ECE department.

Award Recipients

2014 Fall Electric E-Award Winners: Samuel C. Shaffer, Matthew S. Feldman, Michael A. Bifalco II, Paul V. Ryiz, Dr. Harris, Glen H. Walters, Alejandro M.Garcia, Evan E. Shorman, John S. Annunziata Jr. (Photo above) The Computer-E award and Electric-E Awards are awarded to students whose upper-division GPA and major's core courses GPA are both above a 3.9. The first ever Computer E-Award was awarded to David Wilson. (not shown)

Daniel Collotte and Kevin Runda, both graduates of the University of Florida Electrical Engineering program placed third at the annual Texas Instruments (TI) Innovation Challenge. They are shown with Steve Lyle, Director of Engineering Workforce Development and University Marketing for TI.

IEEE Power & Energy Society Scholarship Plus Initiative recipient, Jordan Ehren, with adviser Nicole Young and department chair, Dr. John Harris. (pictured above)

Fall 2014 Student Award Winners:
- Audio Engineering Society Convention Student Design Competition First Place: Jared Williams
- International Microwave Symposium 2014 Student Award Winners: High Sensitivity Radar-UF Electrical Engineering students won third place at the International Microwave Symposium which took place in Tampa, Fl. The team included Tien-Yu Huang, Jianxuan Tu, Chien-Ming Nieh, Changyu Wei, Meiyu Li.
- The SubjuGator team placed 2nd at the 17th Annual International RoboSub Competition in San Diego on August 3, 2014. The PropaGator team placed second at the 7th Annual International RoboBoat Competition July 8-13 in Virginia Beach, VA. ECE Florida congratulates Prof. Eric Schwartz and all team members. (See cover photos)

NEW STAFF

ECE Florida welcomes new faculty
Karim Oweiss, Daniela Oliveira, Sanjeev Koppal, Tuba Yavuz

Karim Oweiss *PhD, University of Michigan, Ann Arbor, 2002. Statistical signal processing and information theory, computational and systems neuroscience, neural engineering, brain-machine interfaces.*

Daniela Oliveira *PhD, University of California, Davis, 2010. Cross-layered and human-centric computer security, operating systems and software vulnerability analysis.*

Sanjeev Koppal *PhD, Carnegie Mellon University, 2009. Computer Vision, Computational Photography, Sensors, Optics, Image/Video Processing.*

Tuba Yavuz *PhD, University of California, Santa Barbara, 2004. Automated verification and analysis, model checking, and automated model extraction.*

[ECE Florida will gain two additional faculty members beginning January 2015.]
Shuo Wang, *PhD Virginia Tech, 2005. Power Electronics, Electrical Power, Electromagnetic Interference, Renewable Energy Conversion and Integration with Power Grid, Power Grid Support with Power Electronics, Electrification of Transportation*

Arturo Bretas, *PhD Virginia Tech, 2001. Power Systems Protection, Analysis and Restoration; Distribution Systems Engineering; Distributed and Renewable Generation Insertion Impact on Electric Power Systems, Smart Grid.*

TONIA LAMBERT joined our department in June 2014 and brings over 19 years of research administration experience with her. She is well versed in proposal submissions and award administration, she has helped faculty with proposal development by providing critical insight on complex rules and guidelines. She received her AA degree in 1998 and is currently pursuing a bachelor's degree in Organization Management at Santa Fe College. Tonia enjoys working with faculty and being part of a research team. She has served on multiple UF committees pertaining to research and research administration and has acted as liaison to the UF Office of Research and numerous granting agencies.

SARAH JOHNSON recently joined the College of Engineering Development Staff as Director of Development and will be responsible for fundraising for ECE and CISE. She has held a variety of university advancement positions in alumni relations and development over the last 12 years. A graduate of Heidelberg University, in Tiffin, Ohio, and Bowling Green State University, Sarah most recently served as Senior Associate Director of Development for the College of Food, Agricultural, and Environmental Sciences at The Ohio State University. Prior to her position at OSU, she worked at the Foundation for Seminole State College in Sanford, Florida as Director of Development.
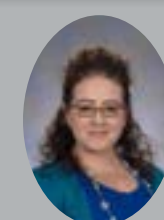
CYNTHIA BLUNT joined ECE in September 2014 as the new graduate adviser. She is a native of Florida; originally from Ocala and grew up in Alachua. She graduated from Florida A & M University and Liberty University. She has been advising for about 6 years and enjoys working with students especially when they graduate and still find time to come back and visit. Her thoughts are, "It is particularly at that point I feel a sense of accomplishment!"

SARA SCHAFFER brings to ECE Florida a diverse background in Higher Education Program Coordination and Digital Media Technology. She received a B.S. Degree in Health Science Education from the University of Florida. She taught science in St. Croix, USVI and continued in the field at Santa Fe College. She spent six years developing a design background and is passionate about marketing education. She is assisting the department with information services, website and social media maintenance. She is the mother of two teenagers. Her hobbies include exercise, dance and fabric design, fitness apparel designs.

SALLY HELGESON joined ECE in June 2014. Her primary responsibility is the reconciliation of accounts for sponsored projects. A Navy veteran, and native of Michigan, Sally has held various executive support positions throughout her career. Upon her discharge from the Navy, she began working for the criminal court system. She held the position of Victim Rights Coordinator for the Prosecuting Attorney's Office in Van Buren County, Michigan for nearly eight years. Prior to joining ECE, she held the position of Executive Assistant to the COO for Kalamazoo Community Mental Health & Substance Abuse Services in Kalamazoo County, Michigan. Sally is "excited to be a part of the ECE team."

ALLISON GATSCHE joined ECE in September 2014 as the advisor for Computer Engineering students. As a Gainesville native, Allison has worked with multiple UF offices over the past 9 years, including the University Athletic Association's Gator Ticket Office, the Disability Resource Center, the University of Florida Police Department, the Office of Student Life as an athlete content tutor, and the College of Liberal Arts and Sciences as a graduate advisor/Preview advisor. After graduating with her Master's degree in Counselor Education from UF in May 2013, Allison began working with Santa Fe College as a transfer academic advisor, working specifically with students interested in careers in the health field. Allison is happy is be back on UF's campus and is looking forward to working with the ECE and CISE departments.

John Harris with Reid Harrison (BSEE 1994) at Intan Technologies in Los Angeles, CA. Reid founded Intan to develop custom low-power analog and mixed-signal integrated circuits for innovative biological sensing applications.

John Harris with Qing Yang (PhD ECE 2011) at Apple in Cupertino, CA. Qing worked on her PhD with Dr. Harris in speech and audio processing. She continues work in this area for Apple's mobile devices.

Current ECE student Julio Chavez giving a tour to Grand Guard alumni visitors on campus. Grand Guard alumni graduated 50 or more years ago from the department.

Jim Martz (BSEE 2009) giving a tour SpaceX to John Harris in LA. Jim is a Missions Operations Engineer and the lead Power Electronics Engineer at SpaceX.

Lingyun Gu (MS ECE 2004) driving his own Tesla. Lingyun is a VC investor and entrepreneur. He co-founded the Turbo Financial Group and now serves on their Board of Directors. He currently works as an investment advisor at IDG-Accel/IDG Capital Partners, a VC firm in LA.

Ryan Tseng (BSEE 2006) with John Harris. Ryan was interested in wireless charging of cell phones and founded WiPower in Gainesville, FL. He led the company to acquisition by Qualcomm. Currently Ryan develops connected health and wellness products at Warehouse Innovations LLC, a company he co-founded in San Diego, CA.

Texas Instruments sponsored the IEEE Tailgate before the Florida-Kentucky football game. Pictured in the photo from left to right are ECE Department Chair John Harris, former IEEE student president Chris Sarli, current IEEE president Trent Fields, ECE alum Robert Taylor (MS ECE 2004) from TI, and ECE professor Eric Schwartz. Photobombing from the back is Brandon Pollack, president of HKN.

Dr. Xinxin Liu, (second from right) is a Gator Engineering alumni and now a Google employee. She gave a tour of Google and Google's Street View Car on a visit. Kim Jacobs (UF Engineering Corporate Foundation Officer), Dean Cammy Abernathy, Dr. Xinxin Liu (Google employee and Gator Engineering alum), and ECE Chair John Harris. Dr. Liu is a former CISE student and worked with ECE Professor Andy Li for her PhD.

YOU MAKE
THE DIFFERENCE

We strive to offer our students in electrical and computer engineering the best possible educational and research opportunities. We believe a strong faculty and a focus on cutting-edge programs are the best components of these oppotunities. Being able to offer more scholarships to outstanding students, providing research opportunities and participation in student chapter activities will help us make the difference between being good and be-ing the best. Your annual gifts to the Department can provide the financial boost to allow our graduates to compete successfully in today's world and to contribute to society.

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