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Message from the department head

The Department of Electrical Engineering and Computer Science at The University of Tennessee continues to grow by several different measures, which are highlighted in this annual report. Our university and college have goals to become Top 25 public university and college, and our department is playing a large role in that effort.

Our freshman and overall undergraduate enrollment continues to increase. In Fall 2014, we welcomed 180 new freshman students, which is an increase of 15% compared to the previous year. Also, our undergraduate enrollment is now 693 students. We have 185 Ph.D. students pursuing degrees and performing research with our 44 tenured and tenure-track faculty members. We have revamped our senior design (page 15) to be a one-year sequence with project ideas and mentoring provided by industry and our department Industry Advisory Board (page 18).

Research expenditures for the department exceeded $14 million for the latest fiscal year. Our faculty continue to do leading edge research in many disciplines and receive national and international acclaim for their activities as shown by the many awards that they have garnered (page 25).

We hired nine faculty during Spring 2014 including six tenure track and three Professors of Practice (see page 26) to provide quality instruction to our burgeoning student body. One of the new faculty hired, Dr. Audrey Mockus, fills the Harlan Mills Chair in Software Engineering and will provide new energy in our computer science program in the areas of software engineering and data analytics. Other new faculty include Dr. Chao Tian (communications), Dr. Garrett Rose (computer engineering), Dr. Hector Pulgar (power systems), Dr. Donatello Materassi (controls), and Dr. Michael Jantz (operating systems).

Former Department Head and Professor Emeritus Dr. Ralph Gonzalez has established the Gonzalez Family Professorship, which has been filled by Dr. Hairong Qi, a prominent professor in image processing (page 4). Endowed professorships and chairs are one of the ways in which we are able to reward and retain our high quality faculty or to recruit prominent faculty from abroad.

Dr. Mike Roberts, who taught almost every undergraduate to come through EECS at UT in the last 30 years retired in May, but he is continuing to teach and advise students as a Professor Emeritus (page 9).

Our NSF/DOE Engineering Research Center, CURENT, passed its third year review in May, and funding has been extended for an additional five years at $4 million/year. CURENT now has 25 industry members and provides research and education opportunities to improve the power grid so that it can better accommodate a high penetration level of renewable energy and have better situational awareness and system security. The deputy director of CURENT and Governor’s Chair in Power Systems, Dr. Yilu Liu, is featured this fall in a commercial that airs during UT football games.

Systers (see article on page 14), the women’s EECS club that started in 2013, has been a big success in invigorating the department by planning several activities such as the Bazenga! – Welcome-back-to-school event and Spring end-of-the-year awards banquet. Systers has organized and sponsored department-wide research and community-building events, a panel on graduate school admissions and funding, a panel on interviewing skills in collaboration with industry partners, and helped members build a support network through other smaller events. They have almost 100 members and are helping with the recruitment, retention, and mentoring of women in our department.

I hope you enjoy our feature articles on the Innovative Computing Laboratory, led by University Distinguished Professor Dr. Jack Dongarra (page 8), super student Jessica Boles (page 13), our IEEE Robotics team that won first place again this year (page 11), and notable alumnus Dr. Ron Nutt (page 5).

My work as department head for the last year has been enjoyable (well, most of the time), as I have gotten to work with and know better our faculty, staff, students, and alumni to continue to make our department one of the most challenging and gratifying places to work and study. We continue to attract the best and brightest from Tennessee and throughout the world as prospective students learn about the many exciting things happening in the Min H. Kao Building. I hope you will stop by sometime and see for yourself.

Best regards,

Leon Tolbert
The University of Tennessee, Knoxville, is continuing its recent growth and making a little history in the process thanks to a recent endowment announcement by Ralph and Connie Gonzalez. Professor Hairong Qi will become the first female to hold an endowed position in the College of Engineering thanks to the Gonzalez Family Endowed Professorship in the Department of Electrical Engineering and Computer Science.

“Gonzalez is a world-renowned name in the area of image processing. Dr. Gonzalez’s popular textbook has become a classic for both researchers and practitioners. Receiving this honor, and in particular thanks to Dr. Gonzalez’s support, sets a high bar and encourages and stimulates me to live up to his legacy,” said Qi. “The resources provided will allow us to build a world-class image processing program and add to that legacy.”

For Ralph Gonzalez, a former head and longtime member of the department, the opportunity to continue his support of UT even in retirement was too good to pass up.

“We established the Gonzalez Family Endowment Fund nearly twenty years ago to enhance the resources available to the Department of Electrical Engineering and Computer Science to recognize superior achievements by faculty and staff,” said Ralph Gonzalez. “My years as a professor taught me the importance of nurturing teaching and research and that a department seeking excellence can’t get there without a competent and dedicated staff.

“We aim though our endowment to recognize the crucial role played by both, with this endowed professorship being just one more step in increasing the level of our commitment.” Gonzalez came to UT in 1970 and joined what was then called the Electrical and Computer Engineering Department. He spent more than a quarter century there, rising to department chair for his last few years before retiring.

In an odd way, that retirement helped spark today’s announcement.

“Fifteen years ago, I was hired to fill his position after his retirement and now, fifteen years later, I’ve been selected for his named professorship,” said Qi. “My gratitude and excitement are beyond words. I feel deeply honored and at the same time, deeply humbled as we all know Dr. Gonzalez’s achievement, and I only hope I’ll live up to that expectation.”

Even while working for UT, Gonzalez began to give back, making a major gift in 1989 and continuing to do so in the intervening years, including the Gonzalez Family Faculty and Staff Endowment and the Gonzalez Family Engineering Global Initiatives Endowment.

“Ralph and Connie have been tremendous supporters of our college and our university over the years,” said College of Engineering Dean Wayne Davis. “Their establishing the professorship has allowed us to help highlight the work of Professor Qi and put a spotlight on her role in that department.”

For the current position, Qi was chosen because of her knowledge of image processing, in particular, ties into a key part of Gonzalez’s background, as he founded Perceptics Corporation in 1982 and molded it into a leader in that field, eventually selling it to the Westinghouse Corporation in 1989.

She has won numerous awards for research and papers, including from the National Science Foundation and the Institute of Electrical and Electronics Engineers.

(David Goddard contributed to this article.)
Dr. Ronald Nutt has had a long and successful career in the medical diagnostic imaging industry, and it all began here at the University of Tennessee. He attended UT in the 1960s, earning three degrees- B.S., M.S. and Ph.D.- all in Electrical Engineering. When going to college, UT was definitely his first choice. “I was reared on a farm in middle Tennessee and thought there was only one university in the world. My brother Bill was a graduate student in agriculture at UT at the time, and he provided all the influence that I needed to enter as a freshman at UT.

“I had several professors that were great. I had two professors that were very inspirational teachers. Dr. Eaves caused me to enjoy mathematics but more significantly taught the class about living and respecting less-fortunate humans. One example was when the math class had started. A late arriving student accidentally kicked over the janitor’s pail of water. The student continued to his seat but before he could be seated, Dr. Eaves reminded him that he didn’t even apologize for his treatment of the janitor. Dr. Eaves immediately asked the student to leave the classroom. After he left, Dr. Eaves explained to the class that this was unacceptable behavior and that we should learn now how to treat others and especially those who work for us and those that have not been as fortunate as we. This lesson has stayed with me for many decades. More than 50 years have passed and I still remember that lesson, and I know that such lessons have significantly shaped my life.

“Dr. J. Frank Pierce was another significant contributor to my life. He was a professor of Electrical Engineering who was very proactive in teaching the latest technologies in electronics. The most important teaching that he provided me and many of his students was a belief in ourselves and that we could do just about anything we wanted to do. He had a remarkable sense of what technology was coming and how important the technology would be.”

After earning his master’s degree in 1962, Dr. Nutt became a researcher at Oak Ridge National Laboratory (ORNL) and taught Electrical Engineering at the University of Tennessee. He received his Ph.D. in 1969 and shortly afterwards took a position with ORTEC, an ORNL spin-off company. Dr. Nutt was Vice President of EG&G ORTEC from 1969 to 1979, where he was responsible for developing many innovations in the field of nuclear physics instrumentation. He was later the co-founder of several other companies, including Technology for Energy Corporation, Radio Systems Corporation and Delta M Corporation.

“After working with ORTEC, I joined a small consulting company, Technology for Energy Corporation, and established a new instrument product line for nuclear power plants. In 1982, TEC was recognized as the third-fastest-growing private company in the country. I co-founded CTI Molecular Imaging in 1983 with Terry Douglass, a good friend and close associate who had become the President of ORTEC.”

Knoxville-based CTI Molecular Imaging “was very focused on the Positron Emission Tomography (PET) and more specifically on the imaging part of the new modality.” PET is a technology that helps reveal how the body’s tissues and organs are functioning. A PET scan uses a radioactive drug, or radiopharmaceutical, to show this activity. It is useful in revealing or evaluating several conditions, including some cancers, heart disease and brain disorders.

“In 1985 we purchased a small company, The Cyclotron Corporation, in Berkeley, California and began to develop an accelerator for the production of the PET radiopharmaceuticals. These two product lines were the primary products of CTI for the duration of the company.”

In 1992, Dr. Nutt and the team at CTI conceived and developed the combination PET/CT (computerized tomography) scanning machine, “the first medical-imaging device that simultaneously and clearly reveals both anatomical details and metabolic processes within the body.” Time Magazine named the PET/CT scanner Medical Invention of the Year for 2000.

“The recognition of the PET/CT by Time Magazine as the most important medical invention of the year 2000 was very important. This modality quickly became the most important imaging modality for characterizing cancer, and today more than 10 million scans per year are per-
formed on cancer patients. Early detection and guidance of treatment are the roles to which PET/CT continues to contribute. The CTI team that stayed focused for more than 20 years is very proud of this accomplishment. We also feel very fortunate to have had such an opportunity in our lifetimes to enjoy this important medical development.”

In 1988, CTI entered into a joint venture with Siemens, called CTI PET Systems, whereby Siemens would sell and service CTI’s products. Siemens eventually bought CTI Molecular in 2005, by which time it had grown to approximately 1,000 employees and was a public company listed on the NASDAQ exchange. After the sale, Dr. Nutt stayed on as chief scientific advisor for a year, to facilitate the transition.

Afterwards, “I took the time to reflect on the most significant need of the PET Imaging industry. The conclusion after much thought was the need for a ‘dose-on-demand’ generator so that hospitals would not be required to take delivery of the rapidly decaying radiopharmaceutical from a PETNet company, but could automatically produce their own. Such a product would make PET much more available to cancer patients. This was the beginning of ABT Molecular Imaging, Inc.” Dr. Nutt and his wife, Lynda, co-founded ABT in 2006.

Also based in Knoxville, ABT makes “a Biomarker Generator that automatically produces the radiopharmaceutical and performs all the quality control functions needed to satisfy the FDA. The Generator is small compared to the large machines used by PETNet and others to produce large quantities of the radiopharmaceutical that are difficult to handle by the imaging staff. The new Biomarker Generator is more like a vending machine that can produce, on-demand, any of the doses needed for imaging. In developing nations there are no companies providing delivery of the radiopharmaceuticals, so the Biomarker Generator is the only solution.”

Throughout his career, Dr. Nutt has been a dedicated inventor, and holds more than 30 patents in the field of molecular imaging, some of which were issued as recently as 2013. He also holds many other types of patents: “I do have several other patents in fields not associated with PET Imaging. One that I am very proud of is a system for measuring time with a resolution of a few nanoseconds and for very long periods of time. I did this invention when I was at ORNL. In the late sixties the technology was used to measure very accurately the distance between the earth and the moon with an accuracy of approximately 12 inches. The invention is now used in PET scanners as well as most laser survey instruments.”

Dr. Nutt has created 3 major endowments in Electrical Engineering and Computer Science (EECS) that bear the Nutt name: the Randall Nutt Engineering Scholarship Endowment for deserving students from Hohenwald, Farragut, and Ooltewah, Tennessee high schools; the Ronald Nutt Family Engineering Scholarship Endowment; and the Ronald Nutt Engineering Fellowship in Imaging and Processing.

In addition, Dr. Nutt, together with Mike Crabtree, Dr. Terry Douglass, and Kelly Milam, established the CTI Professorship, a significant fund in EECS. Crabtree, Douglass and Milam are all EECS graduates who formed CTI Molecular Imaging.

He served on the College of Engineering Campaign Committee during the most recent successful campaign, the Campaign for Tennessee, providing guidance, insight, and support to the Dean and the development team.

Dr. Nutt is also a recipient of the Nathan W. Dougherty award, the highest award given by the College of Engineering. The Nathan W. Dougherty Award is presented to engineers whose professional accomplishments in Tennessee have enhanced the prestige of the engineering profession and/or to those alumni whose professional activities have brought honor and distinction to the College of Engineering and the University of Tennessee, Knoxville.

Dr. Nutt is retired now, but he says, “I am reading and thinking more than I have ever had a chance to do.” He is still active in other pursuits, as well. “I love classic cars and find that they tell the history of our world. I have a few in my collection but would like to spend more time with this hobby. My other hobby is reading on the subject of the interface between religion and science. I am a spiritual person and truly believe that a person who has been given opportunity and capability should contribute back to mankind much more than has been provided.

“My advice to the students is to enjoy your learning experience as a student and organize your spiritual life, your family and your professional life with the proper priority. Also, students should learn as early as possible what they enjoy doing and then develop their profession around that concept.

“I would encourage young engineers to be bolder than I have been. Stability should never be an excuse for not taking action on important career goals and opportunities. If you are willing to work, one will never go hungry or be deprived of a place to live.”

For more than thirty years, **Dr. David W. Straight** was the first point of contact for most UT Computer Science graduate students, coordinating research and teaching assignments and encouraging professional development. Through his classes, Dr. Straight impacted the academic lives of undergraduates in a profound way.

“I joined the CS Dept. here in fall 1975, and retired in 2009,” said Dr. Straight. “I did a lot of teaching, and was chair of the CS graduate admissions and assistantships committee for something like 20 years. I particularly enjoyed working with re-entry grad students - people with degrees in other fields who wanted a change in direction, a chance at something better, so we often had grad students with Ph.D.s in other fields in our grad program, and we saw a number of grandparents who came through and got their master’s degrees. I had a mother and daughter who got their B.S. degrees in engineering get their M.S. in Computer Science under me, and we had mothers and sons in our programs - a wide variety of ages, backgrounds, etc. Students with degrees in music and art usually seemed to do very well.”

When Dr. Straight retired in 2009, some of his former EECS students and colleagues initiated the David W. Straight Scholarship to honor his tremendous influence and to thank him for his exemplary service, as well as to congratulate him.

“We knew that Dr. Straight was appreciated by the students and it was probably Dr. Michael Berry who came up with the idea,” said Dr. Kevin Tomsovic.

“We worked together with the development office to set up the endowment.”

Dr. Berry added, “After David retired, I wanted the department to establish a scholarship in honor of his many years of service to the former CS Department. I e-mailed numerous CS alumni and established the CS/UTK Alumni group on Linkedin.com to get the word out about the scholarship. Doug Sept responded immediately and really helped with a large donation. David helped many of our former M.S. and Ph.D. students get started at UT, and they were very grateful.”

Doug Sept was one of Dr. Straight’s former students, and a major contributor to the scholarship. “I first met Dr. Straight when I was in the Science Alliance summer research program in 1990 and 1991, when I was still in undergraduate school at Trinity University,” said Dr. Sept, who is now a Systems Engineer at Cisco Systems. “Science Alliance was a summer research program that paired UT researchers with potential future UT graduate students to work on a summer research project. I’m not sure what his official role was with the program, but Dr. Straight seemed to be assigned to mentor the group. He took us spelunking, and on many hikes in the Smokies. He went out of our way to make us feel at home in Tennessee, and the sense of community I felt in the Computer Science department at UT was one of the key reasons I picked UT for graduate school.”

Dr. Sept continued, “Dr. Straight was the kind of guy who took a personal interest in the graduate students. You could tell he wanted you to be successful, and would help you find the right career and educational opportunities to make that happen. That’s the kind of guy he is. When the chips were down, he would help you out.

“When I heard that Dr. Straight was retiring, I wanted to contribute to the scholarship because of all he had done for the department and for me personally. Dr. Straight put a lot of himself into the success of the department and it’s students, and it’s important that a guy like that be remembered after he’s retired.”

To date, two students have received the scholarship. In July 2013, Jacob Lloyd Davis was the first recipient, with a $1,500 scholarship for 2013-2014. Aleksander Klibisz was the second recipient in July 2014, receiving a $2,000 scholarship for 2014-2015.
Focus On: The Innovative Computing Laboratory

The Innovative Computing Laboratory (ICL) is a large EECS research and development group situated in the heart of the University of Tennessee’s Knoxville campus. ICL’s mission is to establish and maintain the University of Tennessee as a world leader in advanced scientific and high performance computing through research, education, and collaboration.

ICL’s founder and director, Dr. Jack Dongarra, is a Distinguished University Professor at UT and holds positions at Oak Ridge National Laboratory and the University of Manchester. He established the lab in 1989 when he received a dual appointment as a Distinguished Professor at UTK and as a Distinguished Scientist at Oak Ridge National Laboratory. Since then, ICL has grown into an internationally recognized research laboratory, specializing in Numerical Linear Algebra, Distributed Computing, and Performance Evaluation and Benchmarking. The lab now employs nearly forty researchers, students, and staff, and has earned many accolades, including four R&D100 awards.

The lab’s research focus revolves around three key areas: Numerical Linear Algebra, Distributed Computing, and Performance Evaluation and Benchmarking.

Numerical Linear Algebra - Modern software applications depend on linear algebra libraries to do the handshaking between the actual application and the underlying computer hardware. As technology advances and hardware architectures change, these libraries need to evolve as well. ICL continues to develop these libraries so applications can run faster and more efficiently on modern computer hardware, including machines that use both traditional CPUs and GPUs (graphics cards) to accelerate the potential of performance-oriented applications.

Distributed Computing - High performance scientific computing requires large computer installations with tens of thousands of components, i.e., supercomputers, to effectively model and simulate complex physical phenomena. All of these components must work together, communicating efficiently as possible, to solve some of the world’s most challenging problems. When combining all of these components for a single machine, the mathematical likelihood of component failure increases exponentially. While a personal computer with dozens of components may last for years without a failure, a supercomputer may experience a component failure every few minutes. ICL’s researchers are looking at practical solutions for these problems and creating innovative strategies in the area of Fault Tolerance, which will allow computers to complete a scientific problem or model despite component failures.

Performance Evaluation and Benchmarking - Knowing how applications affect hardware is an integral part of developing more efficient libraries and architectures. Employing hardware counters and related software allows developers to see application performance problems like memory leaks and implement more efficient code. The more efficient the code on a given machine, the more work can be accomplished for a given power constraint. ICL’s research team is constantly integrating new hardware counters and other performance surveillance features within their test suites. ICL-developed software like PAPI (Performance API) and the HPCG benchmark (High Performance Conjugate Gradient) allow developers to see, not only how the underlying computer hardware performs a given task, but also how the applications themselves might be improved and better mapped to the hardware.

Over the past year, the research team at ICL produced 61 publications (17 journal articles, 22 conference proceedings, 16 tech reports, and 6 book chapters), participated in 39 conferences in the US and abroad, and had 14 software releases. ICL is also an NVIDIA CUDA Center of Excellence and part of the Intel Science and Technology Center for Big Data effort. ICL also provides the administrative support for UTK’s Interdisciplinary Graduate Minor in Computational Science (IGMCS). As the lab pushes further into 2014, we expect to continue this upward trend of research, education, and active software development.

(Dr. Terry Moore and Sam Crawford contributed to this article.)
Dr. Michael Roberts retired on May 31, 2014 after a career of service to the University of Tennessee.

He has been at UT full-time since 1984 as a professor, “but I was here earlier than that. The first time I ever came to campus was in 1967, and I was a student. And then I was in graduate school here and got my Ph.D in ’74, and worked for ten years at Oak Ridge and then came here in 1984.”

Dr. Roberts was a Development Engineer at Oak Ridge National Laboratory. “We worked on all kinds of projects. Mainly measuring, instrumentation kinds of things. Design of systems that measure various properties like temperature and force, humidity, pressure, that kind of thing. Mostly my work was involved with measuring temperature, and understanding how thermocouples work. And then we had a special project that we called Johnson Noise Thermometry that I spent a lot of time on, and I’m still spending time on it even now.”

In 1984, he returned to the University of Tennessee, this time as a professor. “I taught a lot of various courses. The first thing I taught was a minicomputer programming course. I’ve also taught quite a bit of optics over the years. I’ve taught from, I guess 1985 to about the mid-90s, in optics. And then, communications systems, circuits, signals and systems; I’ve written books on signals systems. I taught those for several years; still, I even taught them last year.

One of his first teaching experiences was initially unnerving: “When I first started teaching, especially the optics courses, I really hadn’t had much background in [optics]. I said I’d try it and I got the books and started studying. And when I started teaching the first course, I felt like I really wasn’t well prepared. I was afraid that the students would think I didn’t know what I was talking about. After about two weeks I realized that wasn’t a problem at all, because I was way ahead of the students.”

Some things are different now at UT from when he was a student in the ’60s. “One thing I think has changed a lot is the expectations we have for students, undergraduates especially. When I was an undergraduate, which was in 1965, I was at the University of Tennessee at Martin. That’s where I started, and in the fall quarter- we had the quarter system then- the head of the Engineering department there, Mr. Jones, called all the incoming freshmen in for a meeting. There were about 50 or 60 of us in a large classroom, and he told us a lot of things about what to expect. And one of the things he said, which I’ve always remembered, was ‘I want you to look around at all of these people in here in this classroom,’ and he said, ‘in about three years, three-fourths of you will not be in engineering.’ That was a statistical fact at that time. The thing that’s changed, in my view, that I’ve seen, from then until now, is that there is much more emphasis on retaining the students.”

Preparing students for life after college has changed, as well. “Conditions are different now, compared to when I was a student, which was a long time ago now, but that was during the ’60s and the Vietnam War. The attitudes of the students were somewhat different, especially male students, because we had to register for the draft, and if they didn’t keep their grades up and stay in school, they didn’t get a deferment and they had to go to Vietnam. And so that was a real motivating force. Also, the Russians put up the Sputnik satellite, and there was a big reaction in the United States about how we were behind scientifically and we’ve got to catch up. So there was quite a bit of emphasis on science and engineering in schools, and there was money and preferences put on those programs for just a while. Attitudes are different now because we don’t have the same situation with the draft and selective service. Students now, a lot more of them tend to work part-time. I was a co-op student and worked alternate quarters, but a lot of [current students] work while they’re taking courses.”

As in the days of the space
race and the Cold War, in recent years there has been a renewed emphasis on science, technology, engineering and mathematics (STEM) at schools. Dr. Roberts welcomes this development. “Certainly some of the high schools are giving that emphasis now, and that will be good if it will make the students better prepared. One thing I tell my students- sometimes I don’t think they believe me- is that they have to be prepared; that they are now competing with not just other students here at the University when they go out to get a job, or other students in the United States- they’re competing with the whole world. I tell them, there are guys in India and China who are just as smart as you are and just as creative who will work for half of what you’ll work for.”

He would like professors these days to emphasize undergraduate teaching more than research, because he feels it can have a more lasting impact on students’ lives and better prepare them to enter the work force. “You talk to people who have been out three, four, five years, and ask them what they remember about their undergraduate experience, and they’ll tell you, typically, about somebody, a good teacher, who really made an impression on them, and really made a difference in their lives. And I’ve gotten e-mails from students, several times. They’ll say things like, ‘every day in your class I felt like I was going to fail, but after I got through, I felt like I really learned something.’ And as a professor, you have to think: maintain the standards, even if the students are uncomfortable at the time, it will be good for them later on. They don’t know what they can do until they’re asked to do it. You challenge them, and they learn, and at the end of the semester they realize, ‘boy, I’m more capable than I thought I was.’

Some of the achievements of which he is most proud are the textbooks he has written, research work, and challenging his students to excel. “Writing these books- it’s a big effort, it’s a huge effort, to write a textbook. I’ve written three now. It’s very satisfying because you get everything in order, you codify it, you use consistent notation, you feel like it’s all logically consistent, and you know what you’re talking about, and the students should, if they read the book, too. Because it’s hard to communicate it so well to them, but you feel like, at least to yourself, you’ve accomplished something. “The other thing would be the work I’ve done over the years in Johnson Noise Thermometry. I’m still doing some consulting in that right now, at Oak Ridge, and I really enjoy that, and it’s a chance to do something that’s really kind of leading edge, something that hasn’t been done before. Those are the two things I look back on. And, just getting undergraduates to realize they can do more than they can do, and getting a little feedback from some of them, realizing that they really did work.”

His advice to students is simple, tried and true: “I think you’ll hear it in almost any commencement speech you’ll see on TV, about college is- and it’s something like this- try to find out what you really enjoy, and do it. Because if you really enjoy it, you’ll be good at it, and if you’re good at it, somebody will hire you to do it and you’ll get paid.”

Looking to the future, not just for engineering graduates and the coming job market, but for engineering education in America as well, Dr. Roberts says, “It always comes down to economics- how are we, as the United States, competitive in the world market? Are we still competitive now or not? Right now, our graduate schools, I think, are still the envy of the world, and people come here, and that’s good. I don’t know how long it’s going to last, because we do have really strong competition with the Chinese, and India, too, and they have a lot of people, so it’s going to be a tough competition.”

In order to remain competitive, he says, “I just would emphasize a little more undergraduate teaching, because I think it’s important to have that cadre of people who are not going to be professors, who are going to be industrial workers, and they need to have the preparation, and they need to have high standards.”

As for his post-retirement plans, he says, “I just signed papers for half-time contract work. I’m going to be teaching one course per semester.

“I have also been, over the last few weeks, volunteering at the Great Smoky Mountains National Park. I’m what’s called a ‘dome rover.’ I’m at Clingman’s Dome every Sunday. I’m there, I have a little uniform that I wear, and I walk up and down the walk, spend some time in the information center and the parking lot. And if people come by, I smile and greet them, and if they have questions I try to answer them. It’s nice, low pressure- Clingman’s Dome is a very nice environment, and I get a nice workout walking up the walk every time.”

Whether he is teaching a class, volunteering in the Smoky mountains or consulting for ORNL, Dr. Roberts feels like he is in a good place in his life. “What I’m doing right now is very enjoyable; it’s a great experience.”
Thanks to crowdfunding, the IEEE Robotics Team at the University of Tennessee has a first place showing in the IEEE SouthEastCon 2014 robotics competition.

Crowdfunding is a fundraising technique that enables a project to be funded by many donors, instead of just one benefactor. It is a recent phenomenon that has been facilitated through the Internet, used by sites such as Kickstarter and Indiegogo.

In 2014, the UT Office of Alumni Affairs and Development established a new crowdfunding initiative called “Impact Big Ideas.” Through this initiative, students, faculty and alumni can discover and fund a number of projects at UT. Lance Taylor, UT Alumni’s Director of Annual Giving and Student Philanthropy, said that not many large schools like UT are doing crowdfunding yet, but there are some smaller colleges doing it, and it’s starting to catch on. Unlike Kickstarter and efforts of that nature, 100% of the money raised through “Impact Big Ideas” goes directly to the projects and student organizations. It’s something that can be done for projects and organizations in any college or department.

Last fall, the IEEE Robotics Team was the first student group in the College of Engineering to be a part of this new fundraising initiative. Their goal was to raise $1,500, for the undergraduate and graduate robotics teams. This would cover the costs of travel and robotics, as well as registration fees, to compete in the IEEE SouthEastCon 2014 against 47 other teams from universities from around the southeast region.

The UT Alumni Association promotes the university’s overall crowdfunding efforts with targeted e-mails to former UT students, which helps raise awareness for projects like that of the IEEE Robotics Team. Another factor contributing to the fundraising success was last November’s Big Orange Give, a 125-hour online giving campaign to raise $125,000 for various student projects. Over three-quarters of these gifts were for less than $100, which shows the power and potential of crowdfunding. An individual donor may not be able to contribute enough to fully fund a project, but many donors pledging small amounts can collectively succeed in putting a fundraising goal over the top.

Impact Big Ideas enabled the team to exceed the target amount with a total of $1,738 raised by their deadline of January 2014. Thirteen donors in all contributed online toward the team’s goal.

Impact Big Ideas
On March 13-16, 2014, the graduate IEEE Robotics Team competed with their robot to navigate a course while shooting foam darts at a target mounted at one end of the course. The goal was for the robot to follow a predetermined path, stop at correct locations, aim and fire at the target, and reach the finish line. The teams were scored on their accuracy in hitting the target and the total time for completion. With their robot- named G.I. Joe- the graduate IEEE Robotics Team won first place for the second year in a row in the Open Hardware Competition. In addition, the undergraduate IEEE Robotics Team claimed 15th place in the Student Hardware Competition with their robot, named Smokey.

Graduate team leader Ammar Alkhuwaiter said, “The team's crowd-funding experience was more than an awesome adventure. Besides the great financial support that we got by exceeding our fundraising goal, it helped our team to gain visibility in our community and build our members confidence towards success. When you see that many people believe in you, you feel that nothing can beat you, and you are set to accomplish great things. The funds that we got helped us finish building our robots earlier than the competition deadline, which gave us a lot of time for extensive testing and tweaking that was a key to this year’s win.”

Though their robotics competition credentials are impressive, the outreach the team does for statewide and local high schools is the true measure of success. Through the FIRST Robotics program, the IEEE Robotics team works with high school robotics teams to prepare for regional and national competitions and build award winning robots while advocating for students to pursue STEM (Science, Technology, Engineering, and Mathematics) majors in college. The IEEE Robotics team provides tours of the University of Tennessee campus and highlights participation in STEM fields.

“Besides winning the competition, that funding also helped us with our outreach efforts with our community by holding information sessions and workshops multiple times to encourage pre-college students to attend one of UTK College of Engineering programs after graduating from high school. We’ll definitely be using the same fundraising technique for next year’s robotics competition, if we get the chance to do it,” said Alkhuwaiter.

IEEE ROBOTICS TEAMS:

Undergraduate Team
Brett Brownlee
David Combs
Jacob Lamberson
Andrew Messing
Parker Mitchell
Maxx Robinson
Alex Roschli
Kevin Sayarath
Carlos Whited
Nick Winston
Alex Woodard

Graduate Team
Ammar Alkhuwaiter
Joe Bray
Jacob D’avy
Ben Goodrich
David Jackson
Benjamin Martin
Nicole Pennington
Alexander Saites
Aravinda Ramakrishnan
Srinivasan
EECS Student Profile: Jessica Boles

Jessica Boles is an Electrical Engineering Honors major with a Power and Energy Systems concentration and a 4.0 GPA. The 21-year-old student from Murfreesboro, Tennessee is involved with the Systers: Women in EECS student organization, whose mission is to recruit, mentor and retain women in Electrical Engineering and Computer Science at the University of Tennessee. “My involvement with Systers began when I spontaneously decided to volunteer at [Systers’ event] Bazinga! in 2013. After that, I joined Systers’ Professional Development Committee, and I enrolled in the first Lean In seminar class taught last spring by our Systers president. “This year, I have been elected the Vice President of Systers. I served as Volunteer Coordinator for Bazinga!, and I’ll lead the Mentorship Committee, which fosters and assists mentorship between members, for Systers for the remainder of the school year. I’ve also been funded by Systers and the EECS department to attend the Grace Hopper Celebration of Women in Computing conference to be held in Phoenix, Arizona in October, 2014.”

Jessica is also involved with CURENT, the Center for Ultra-wide-area Resilient Electric Energy Transmission Networks. It is the National Science Foundation’s Engineering Research Center within the Department of Electrical Engineering and Computer Science.

“My involvement with CURENT began in February 2012, spring of my freshman year, when I began assisting Ph.D. students with their power electronics research wherever possible. My sophomore year, I served as the power electronics lab webmaster, and I began work on a more independent research project my junior year, with the help of a Ph.D. student. My junior year, I became an Undergraduate Ambassador for CURENT and served as the Social Events Committee Chair for CURENT’s Student Leadership Council. Also, CURENT, Systers, and the EECS department funded me to attend the IEEE Women in Engineering Leadership Conference in San Francisco this past May.”

**Recent Honors:** Boles was chosen Most Outstanding Electrical Engineering Sophomore in 2012-2013, and won the same accolade again as a Junior in 2013-2014. In December, 2013, She was chosen to travel with CURENT to China for partner university visits. Over the summer, she was fully funded to study Spanish at the Universidad de Alicante in Spain. She made the College of Engineering Dean’s List, Summa Cum Laude, from 2012 to 2014. And at Siemens, one of Jessica’s projects was voted top of the fiscal quarter for the electrical R&D group by her peers.

**Professional Experience:** In 2012, Boles interned at Cyber Sciences, Inc., working on web software-related activities. In 2013, she had an Electrical Engineering internship at Siemens Molecular Imaging, where she performed hardware testing and troubleshooting.

In addition to her studies and related activities, Boles is also involved in a competitive club tennis team; the Honors Community Board; Student Government Association, as a College of Engineering Senator in 2012; and Campus Crusade for Christ.

It seems like Jessica’s path to Electrical Engineering was set early on. “Growing up, I helped my dad, a mechanical engineer, with some of his tinkering projects in our garage. I was most attracted to the electrical components of these, but I didn’t decide on electrical engineering until my freshman year of college here at UT. In high school, I was always drawn to math and physics classes, and I hope to feed my passion for those subjects by applying them to real-life problems with engineering.”

Jessica is driven to excel. “I’ve always been a perfectionist, and early in high school, I adopted the motto ‘Know no limits’ to serve as a guide throughout each of my academic, athletic, and artistic pursuits. That motto continues to impact my life today, even though sometimes I overwhelm myself. Regardless, I’m not the type of person who enjoys watching TV or playing video games. I strive to use my time as efficiently as possible, always working to improve myself or simply just learning.”

Looking to the future, she says, “I have plans to begin working towards my Master’s degree in Power Electronics here at UT following graduation as part of the Five Year B.S./M.S. program. As an electrical engineer, I aspire to help develop economical renewable energy sources and their implementation into our power grid in preparation for future sustainability needs.”

In the meantime, Boles is also focused on at least one more immediate pursuit: “I’m attempting to learn the Polish language in my free time this semester.”
Systers Making Great Strides into its 2nd Year

Systers: Women in EECS
@ UTK is a volunteer student organization whose mission is to recruit, mentor, and retain women in the Electrical Engineering and Computer Science (EECS) department. Now entering its second year at the University of Tennessee, Systers is proud of its accomplishments so far: mentoring young women entering EECS, reaching out to girls in the community to tell them about opportunities in their field, and helping ensure that talented students have access to the department’s resources and the community’s industry opportunities, regardless of gender.

These activities have earned Systers increased exposure over the last year. This includes interviews, quotes and other mentions in local, national and online media, such as WATE-TV and WBIR-TV in Knoxville, Dice.com and the USA Today. Activist, author and Facebook Chief Operating Officer Sheryl Sandberg even mentioned Systers in her latest book, “Lean In For Graduates.”

Additionally, the UT Alliance of Women Philanthropists announced the 2014 recipients of its Giving Circle Grants at the sixth annual Women and Philanthropy Symposium in February. Systers in EECS @ UTK was one of seven recipients, with a grant of $13,305, which will be used to assist in funding speakers and travel.

The group participates in professional development events, such as holding workshops and attending conferences as well as social events for students, like “Volunteers Say Bazinga!,” an EECS building party. Systers organizes and sponsors department-wide research and community-building events, panels on graduate school admissions and funding, panels on interviewing skills in collaboration with industry partners, and helps members build a support network through other, smaller events.

Systers also attends multiple women in computing conferences, like the Grace Hopper Celebration for Women in Computing. This year, Systers will be sending 17 students to Phoenix, Arizona in October for this annual gathering.

The group hosted its second annual “Volunteers Say Bazin-gal” event in the Min Kao building in August. This is Systers’ first and largest event of the school year. Hundreds of EECS students descended upon the Min Kao Electrical Engineering and Computer Science building to kick off the semester with a party that included food and drink, music, lab demonstrations, networking opportunities, games, contests and prizes. Current EECS students answered new students’ questions, professors and students demonstrated their research, and students and businesses exchanged ideas and inspiration.

Future events will include technical talks, professional development, participation in career fairs and more social gatherings.

Systers’ mentorship program seeks to build community and individual students’ confidence. Systers, through different avenues, assigns a mentor to each student who wishes to have one. This mentor is sometimes “one step up” from that student, meaning that the mentor has recently been in the same position as her mentee, and she has the necessary insights for success. Moreover, the mentor/mentee relationship is judgment-free, so students can feel free to ask any question without fear of appearing weak to their mentors.

Systers is also involved with the community, from giving tours of the Electrical Engineering and Computer Science department building, presentations and demonstrations, to volunteering at science fairs and schools. One example of a successful community outreach event is the Hour of Code. At last year’s Hour of Code, Systers volunteers assisted 25 girls at Vine Middle School in Knoxville as they wrote their first computer programs.

The positive feedback Systers received from the girls and their teacher has encouraged this ambitious group of EECS students to seek new ways to introduce young women to Computer Science in the years ahead.
Every day, multiple National Oceanic and Atmospheric Administration (NOAA) weather satellites pass above you in a low-earth orbit. Each NOAA weather satellite broadcasts a radio signal containing a live weather image of your area. This signal is not encrypted, so anyone with the right equipment and knowledge can download and display these live images several times a day. A group of senior EECS students is designing a kit to do exactly that, as part of their EECS Senior Design course.

The primary purpose of EECS Senior Design course sequences, ECE 401/402 and COSC 401/402, is to provide EECS seniors with design experience. Students are organized into teams of 3 to 5 and complete two design projects, one per semester.

The first project is not intended to be technically challenging. Its purpose is to reinforce the concepts behind the design process and teamwork. The second design project is selected by each team, and may be from a posted list of possible projects compiled for the courses or suggested by the team.

The team that is working on the NOAA weather satellite image project, collectively called Team 11, consists of Computer Engineering students Charles Collins and Michael Minneci and Electrical Engineering students Alex Woodard and Derek Hayes.

For their second design project, they hope to create a “software defined radio” kit that is lightweight, portable, inexpensive, easy to assemble and easy to use. Software-defined radio (SDR) is a radio communication system where components that have been typically implemented in hardware, such as amplifiers, mixers and filters, are instead implemented by computer software. The planned product will initially use a laptop to capture the NOAA satellite data, but ideally they would like to incorporate the Raspberry Pi, a low-cost, credit card-sized computer. It will also utilize open-source software that the user can modify to suit his or her needs. An example of a potential application for such a kit is for use by sailors on the ocean who want to obtain recent weather data, but who are out of range of land-based transmissions. Imagery from the NOAA satellites could warn them of approaching storms and provide other valuable data.

Other Senior Design teams are working this fall on such projects as a “3D Partial Differential Equation System,” an “Automated-Tracking USB Missile Launcher,” a “One Time Pad Communication and One Time Password Authentication via Smartphone,” and “The Vol Weather Project: Obtaining and Sharing Campus Weather Data via a new Weather Station.”

The senior design sequence is not about teaching new analysis methods or skills – it is about the integration of what the students know from their coursework and the use of this knowledge to explore alternatives to the solution of challenging design problems and carry through this process to completion. It is also about learning to function effectively as members of teams, learning the ethical responsibilities of engineers and computer scientists, learning to communicate effectively, both in writing and orally, learning to appreciate the local and global impacts of engineering and computer science on society and civilization.

While new analysis techniques are not taught, it is certain that new techniques must be learned throughout the course. Engineers and computer scientists must continue to learn throughout their professional lives in order to be productive and to remain relevant and employed. Self-directed learning is necessary in this course, and the skills that are utilized should remain useful throughout each student’s career.
Department profile

Our Mission:
- To prepare students for entry into the profession;
- To instill in students the capabilities required by the discipline, the recognition of the need to enhance the discipline, and the desire for lifelong learning; and
- To equip students with a general knowledge and/or research capabilities in technical and non-technical disciplines so that they are prepared for further study and contribution in other fields, including professional and graduate education.

Our Vision:
We are resolved to become one of the country’s top public EECS departments. To bring this vision to reality, the department is committed to these six charges:

- Attaining national and international recognition among peer institutions for excellence in both research and teaching.
- Assembling a dynamic body of faculty who exemplify excellence and innovation in the pursuit and delivery of knowledge, and will perpetuate the highest standards of education in EE, CE, and CS.
- Graduating students who are well-educated in technical knowledge, who have solid communication and teamwork skills, and who can compete successfully in the global business and research world.
- Maintaining technical relevance in response to scientific and engineering advances, and the evolving student body.
- Investing strategically in the college’s most important resources — students, faculty, and programs — through the vigorous acquisition of grant and contract funding from agencies, corporations, and foundations.
- Partnering with academic, industrial, and government entities that share and enhance the mission of the department so that our educational, research, and collaborative efforts result in the maximum positive economic impact locally, regionally, nationally, and globally.
Bachelor of Science
Electrical Engineering
Computer Engineering
Computer Science

Master of Science
Electrical Engineering
Computer Engineering
Computer Science

Doctor of Science
Electrical Engineering
Computer Engineering
Computer Science

Enrollment (Full-Time)
Academic Year 2013-2014
Undergraduate 608
Graduate 225
Total 831

Degrees Granted
Academic Year 2013-2014
Undergraduate 96
Graduate 59
Total 155

Faculty
Academic Year 2014-2015
Professors 21
Associate Professors 12
Assistant Professors 11
Total 44

Fall 2014 Freshman Enrollment
Computer Science 74
Computer Engineering 56
Electrical Engineering 50
Total EECS Freshmen 180

Freshman enrollment is a 15% increase over the previous year.

All undergraduate degree programs under the Department of Electrical Engineering and Computer Science are accredited by ABET.


16th nationally among public EECS programs in research expenditures per tenure-line faculty member. Research expenditures grew 41% from FY 2010 - FY 2013.

19th nationally among public EECS programs in PhD enrollment per tenure-line faculty member. PhD enrollment grew 14% from Fall 2010 - Fall 2013.
Chairperson

Mr. C. Chris Meystrik
Chief Technology Officer
Jewelry Television
Knoxville, TN

Members

Dr. Thomas Chapin
Vice President of Corporate Research
Underwriters Laboratories, Inc.
Northbrook, IL

Dr. Rebecca Collins
Software Engineer
Google
New York, NY

Dr. John Garrison
Engineer
Huntsville, AL

Mr. Joe Gipson
Operations Manager
Cisco Systems
Knoxville, TN

Dr. Brad Grinstead
Senior Vice President
IAVO Research and Scientific
Durham, NC

Dr. H. M. ("Hash") Hashemian
President
AMS Corporation
Knoxville, TN

Mr. Jeffrey D. Lamoree
President and CEO
EnerNex Corporation
Knoxville, TN

Mr. Ken Lowery
Senior Partner
Cadre5, LLC
Knoxville, TN

Mr. John McNeely
President and CEO
Sword & Shield Enterprise Security, Inc.
Knoxville, TN

Dr. Mohammad M. Mojarradi
Principal Engineer and Group Supervisor
Jet Propulsion Laboratory
Pasadena, CA

Mr. John B. O'Dell, Jr.
Supervisor of IT Financial Reporting &
Analysis and Contract Relationship Manager
Eastman Chemical Company
Kingsport, TN

Dr. Jelena Pjesivac-Grbovic
Senior Software Engineer
Google Inc.
Mountain View, CA

Mr. Dan Roberts
President & CEO
InterFET Corporation
Richardson, TX

Mr. Ron Thompson
Director, Business Development
Emerging Technologies & Markets
Electrical Sector- Global Marketing
Eaton Corporation
Louisville, TN

Dr. Ken Tobin
Director and Corporate Research Fellow
Measurement Science and Systems
Engineering Division
Oak Ridge National Laboratory
Oak Ridge, TN

Dr. Richard (Dick) Todd
President
RIS Corp.
Knoxville, TN

Mr. Dave Tolman
Electrical/I&C Engineering Manager
Enercon Services
Kennesaw, GA

Mr. Terry Tyler
Former EVP, CTO and CIO
ENMAX Corporation
Knoxville, TN

Mr. Tim Wheelock
Director of Knoxville Operations
Siemens Medical Solutions USA, Inc.
Knoxville, TN

Mr. J. D. Wilson
Distribution Engineer
Georgia Power Company
Woodstock, GA

Dr. Brian Worley
President and Chief Executive Officer
PYA Analytics, LLC
Knoxville, TN

Ms. Angela Yochem
Global Chief Information Officer
BDP International
Philadelphia, PA
Departmental Scholarships 2014-2015

Carol and Malcolm Bayless  
Benjamin A. Brock  
Joseph T. “Joe” Teague

Dr. M. E. and Mrs. J. N. Casey  
Seth A. Rausch

Grace O. Davis  
Benjamin J. Ramsey

Department of Electrical Engineering & Computer Science  
Isaiah J. Minter  
Ronald W. Randolph  
Qingqiu Yu

Christopher J. and Michelle R. Gentry  
Joseph D. Estrada

S. T. Harris  
Elliot D. Greenlee  
Benjamin E. Mills  
Adam M. Seal  
Christopher B. Tester

Urban and Susan Hilger  
Jeremy J. Langford

Beta-Phi Chapter, Eta Kappa Nu  
Benjamin J. Ramsey

Dr. E. Johnson and Mrs. L. H. Kennedy  
Nicholas A. Cavopol

Alliene Lay  
Jeremy J. Langford

W. O. Leffell  
Kevin A. Dunn  
Milan Patel

Edgar Wyman McCall  
Kenton W. Culbertson

Harlan D. and Luella C. Mills  
Sharvari S. Desai

Billy J. and Sylvia F. Moore  
Derek B. Lusby  
Michael D. Price

L. B. Murray, Jr.  
Derek B. Lusby

Leonard B. Murray, Sr.  
Michael S. Fields

Erby Roy and Jean Bush Nankivel  
Spencer P. Cochran  
Michael S. Fields  
Jacob Ortman  
Wilson P. Parker  
Michael G. Trout

Leonard and Betty Shealy  
Justin Clark  
Gabriel J. Hanas  
Andrew K. Messing  
Benjamin D. Roberson  
Tyler B. Stuessi

Charles and Martha Sprankle  
Kyle G. Bashour  
Hollis X. H. Bui  
John A. Burnum  
Joseph P. Diamond  
John P. Dorris  
Adam P. Howard  
Jonathan T. Jackson  
David Lu  
Brandon T. Storz  
William T. “Ty” Vaughan

David W. Straight  
Aleksander Klibisz

Fred Smith Vreeland  
Dillon R. Hunneke

Charles Weaver Memorial  
Seth A. Rausch

Arthur F. Woods  
Jared W. Bolin  
Douglas W. Bouler  
Jeffrey C. “Coburn” Brandon  
Kyle J. Goodrick  
Matthew A. Lambert  
Garrett R. Massman  
Alex C. Roschli  
Haley E. Whitaker  
Michael A. Wilder  
Nicholas R. Winston

Min H. Kao Scholars  
Pranshu Bansal  
Jared A. Baxter  
Natalie R. Beitel  
Jessica D. Boles  
William A. Brummette  
Isaiah C. Cash  
Summer F. Church  
Jacob L. Davis  
Joseph R. Dorris  
John W. Duggan  
Richard H. Fagan  
Austin C. Fullbright  
Randall N. Glover  
Saajid A. Haque  
Harry N. Hughes  
James T. Hunter  
Richard A. McEver  
Anthony P. Meyer  
Connor C. Minton  
John P. Mitchell  
Benjamin D. Parrott  
Samuel B. Rose  
Karsten M. Solies  
Taylor A. Thomas  
Ryan D. Wagner  
Aaron R. Young
### Departmental Fellowships 2014-2015

<table>
<thead>
<tr>
<th>Fellowship</th>
<th>Recipients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bodenheimer Fellowship</td>
<td>Adam W. Disney, Richard K. Harris, Jeremy J. Langford, Charles K. Roberts, Jacob H. Shelton</td>
</tr>
<tr>
<td>Dr. Vaughn Blalock Graduate Memorial Award</td>
<td>Alexander L. McHale</td>
</tr>
<tr>
<td>Chancellor’s Honors Award</td>
<td>Shawn M. Cox, Jeffery M. Dix, Ling Jiang, Edward A. Jones, Ifana Mahbub, Farhan Quaiyum, Christopher M. Reardon, Madeline N. Threatt</td>
</tr>
<tr>
<td>ESPN Fellowship</td>
<td>Alok Hota, Hantao Cui, Chongwen Zhao</td>
</tr>
<tr>
<td>Min. H. Kao Fellowship</td>
<td>David A. Basford, Yutian Cui, Ali Mohsin, Xiaojie Shi, Wei Wang, Zheyu Zhang</td>
</tr>
<tr>
<td>National Science Foundation (NSF) Award</td>
<td>Catherine D. Schuman</td>
</tr>
<tr>
<td>Ron Nutt Graduate Fellowship</td>
<td>Joshua C. Dunn, Sang H. Lee</td>
</tr>
<tr>
<td>University of Tennessee, Graduate Fellowship Award</td>
<td>Madeline N. Threatt, Shipley Swann Fellowship</td>
</tr>
</tbody>
</table>
By the numbers

How EECS at UT compares to peer and aspirational institutions

We’ve collected data from universities we consider peers and aspirational peers over the past year to see how our EECS program compares. The data from our peers and aspirational universities has been averaged and displayed in the following charts.

Financial Information
Numbers reflect the department’s financial information for FY14.

Total Resources
$23,934,387

Expenditure Breakdown of State Funds
$9,260,380

- Salaries & Benefits
  - $191,851
- Equipment
  - $1,390,540
- Miscellaneous Operating Expenses
  - $7,677,987

Externally Funded Gifts, Grants & Contracts

Recurring & Nonrecurring State Funds

$14,674,007
EECS has 44 (for 2014-2015) full-time tenured and tenure-track faculty members who are all leaders in their fields. Each year they successfully compete for and receive prestigious awards and accolades. Their research and scholarship are not only helping keep the department on the cutting edge of its disciplines, but also teaching and training the engineers of tomorrow.

### Strength Area

<table>
<thead>
<tr>
<th>Strength Area</th>
<th>Tenured/Tenure-Track Faculty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biological applications</td>
<td>Berry, Birdwell, Day, Holleman, Islam, Langston, McFarlane, Peterson, Vose, Wu</td>
</tr>
<tr>
<td>Computer systems and architecture</td>
<td>Beck, Dean, Jantz, Mockus, Peterson, Plank, Rose, Vander Zanden</td>
</tr>
<tr>
<td>High performance and scientific computing</td>
<td>Banks, Berry, Dean, Dongarra, Gregor, Huang, Langston, Vose</td>
</tr>
<tr>
<td>Intelligent systems, data mining, and machine learning</td>
<td>Arel, Berry, Birdwell, Gregor, MacLennan, Mockus, Parker, Qi, Vose</td>
</tr>
<tr>
<td>Microelectronics, microwave, and MEMS</td>
<td>Blalock, Fathy, Gu, Holleman, Islam, McFarlane, Wu</td>
</tr>
<tr>
<td>Networked and embedded systems</td>
<td>Beck, Cao, Djouadi, W. Gao, H. Li, Parker, Qi, J. Sun, Tian</td>
</tr>
<tr>
<td>Power systems, power electronics, and renewable energy</td>
<td>Costinett, F. Li, Liu, Pulgar, K. Sun, Tolbert, Tomsovic, F. Wang</td>
</tr>
<tr>
<td>Signal processing, systems, and controls</td>
<td>Birdwell, Djouadi, H. Li, Materassi</td>
</tr>
<tr>
<td>Visual computing and image processing</td>
<td>Abidi, Arel, Banks, Gregor, Huang, Qi, Vander Zanden, Vose</td>
</tr>
</tbody>
</table>
Mongi Abidi  
Ph.D. The University of Tennessee  
Cook-Eversole Professor, Advisor for UT Robotics Graduate Student Team, which won first place in the IEEE SouthEastCon hardware competition

Itamar Arel  
Ph.D. Ben Gurion University (Israel)  
Success in Multidisciplinary Research Award, 2014

David Banks  
Ph.D. University of North Carolina, Chapel Hill

Micah Beck  
Ph.D. Cornell University

Michael W. Berry  
Ph.D. University of Illinois

J. Douglas Birdwell  
Ph.D. Massachusetts Institute of Technology  
IEEE Fellow, College of Engineering 2014 Translational Research Award

Benjamin J. Blalock  
Ph.D. Georgia Institute of Technology  
Kennedy-Blalock-Pierce Professor

Qing (Charles) Cao  
Ph.D. University of Illinois

Daniel J. Costinett  
Ph.D. University of Colorado

Judy Day  
Ph.D. University of Pittsburgh

Mark Edward Dean  
Ph.D. Stanford University  
Fisher Distinguished Professor  
IEEE Fellow, National Academy of Engineering Member

Seddik M. Djouadi  
Ph.D. McGill University (Canada)

Jack Dongarra  
Ph.D. University of New Mexico  
University Distinguished Professor  
IEEE Fellow, National Academy of Engineering Member, 2013 ACM-IEEE Ken Kennedy Award

Aly E. Fathy  
Ph.D. Polytechnic Institute of New York  
James W. McConnell Professor  
IEEE Fellow, Chancellor’s Award for Excellence in Graduate Mentoring & Advising, 2014

Wei Gao  
Ph.D. Pennsylvania State University

Jens Gregor  
Ph.D. University of Aalborg (Denmark)

Gong Gu  
Ph.D. Princeton University

Jeremy H. Holleman  
Ph.D. University of Washington  
College of Engineering Outstanding Professional Promise in Research Award, 2014

Jian Huang  
Ph.D. The Ohio State University

David Icove  
Ph.D. The University of Tennessee  
UL Professor of Practice, UT College of Engineering Charles Edward Ferris Award

Syed Kamrul Islam  
Ph.D. University of Connecticut  
James W. McConnell Professor and Associate Department Head, Alexander Prize, 2014-2015, EECS Faculty of the Year, 2013-2014

Michael Jantz  
Ph.D. University of Kansas

Andreas Koschan  
Ph.D. Technical University Berlin

Michael A. Langston  
Ph.D. Texas A&M University  
Chancellor’s Award for Research and Creative Achievement, Featured Faculty, College of Engineering Annual Report (Celebrating 175 Years), University of Tennessee, Fall, 2013

Fangxing (Fran) Li, P.E.  
Ph.D. Virginia Tech

Husheng Li  
Ph.D. Princeton University

Yilu Liu  
Ph.D. The Ohio State University  
Governor’s Chair Professor  
IEEE Fellow

Bruce J. MacLennan  
Ph.D. Purdue University  
Success in Multidisciplinary Research Award, 2014, Alumni Outstanding Teaching Award

Donatello Materassi  
Università degli Studi di Firenze (Florence)

Nicole McFarlane  
Ph.D. Maryland University

Audris Mockus  
Ph.D. Carnegie Mellon University  
Harlan Mills Chair Professor, Distinguished Paper Award, 11th Working Conference on Mining Software Repositories, 2014

Lynne E. Parker  
Ph.D. Massachusetts Institute of Technology  
Professor and Associate Department Head  
IEEE Fellow, UTK Chancellor’s Honor: Success in Multidisciplinary Research, 2014, College of Engineering Leon and Nancy Cole Award, 2014, Computer Scientist of Distinction (highest College of Engineering Alumni Award), Tennessee Technological University, 2014

Gregory D. Peterson  
Ph.D. University of Washington (St. Louis)

James S. Plank  
Ph.D. Princeton University  
NSF Career Award, ACM/IEEE/Systers “CS Faculty of the Year” Award, 2013-2014

Hector Pulgar-Painemal  
Ph.D. University of Illinois at Urbana-Champaign

Hairong Qi  
Ph.D. North Carolina State University  
Gonzalez Family Professor

Garrett Rose  
Ph.D. University of Virginia

Jinyuan (Stella) Sun  
Ph.D. University of Florida

Kai Sun  
Ph.D. Tsinghua University (China)  
Best Conference Papers Award, IEEE Power & Energy Society General Meeting, 2014

Chao Tian  
Ph.D. Cornell University

Leon M. Tolbert, P.E.  
Ph.D. Georgia Institute of Technology  
Min H. Kao Professor and Department Head  
IEEE Fellow

Kevin Tomsovic  
Ph.D. Washington University  
CTI Professor, IEEE Fellow, IEEE Power Engineering Society Technical Council Distinguished Service Award

Bradley T. Vander Zanden  
Ph.D. Cornell University

Michael D. Vose  
Ph.D. University of Texas

Fei (Fred) Wang  
Ph.D. University of Southern California  
Professor and Condra Chair of Excellence in Power Electronics  
IEEE Fellow

Jie (Jayne) Wu  
Ph.D. Notre Dame

Yan Xu  
Ph.D. The University of Tennessee, Fall, 2013  

Jing Yang  
Ph.D. University of California  
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Yan Xu  
Ph.D. University of Tennessee  
Eastman Professor of Practice

The IEEE Industrial Electronics Society established the Dr. Bimal Bose Award in honor of Professor Emeritus B.K. Bose.
An internationally recognized forensic engineering expert with over 40 years of experience, Dr. David Icove’s expertise is based on a blend of university teaching, on-scene fire tests and experiments, and authorship of several peer-reviewed textbooks and articles. A retired federal law enforcement agent, he has testified as an expert witness in civil and criminal trials, as well as before U.S. Congressional Committees seeking guidance on key legislative initiatives.

Position: UL Professor of Practice

Ph.D.: Engineering Science and Mechanics, University of Tennessee, 1979

Research areas:
- Forensic engineering analysis of electrical cable fires in power plants
- High performance computational modeling of fires and explosions
- Cyberterrorism, intrusion detection, and computer security
- Pattern recognition, artificial intelligence, and image processing

Dr. Icove is a Reserve Knox County Deputy Sheriff assigned to the department’s Fire Investigation Unit.

Recipient of the UT College of Engineering Charles Edward Ferris Award, 2013

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Dr. Michael Jantz is an Assistant Professor in the EECS department at the University of Tennessee. He received his B.S. (2008), M.S. (2010) and Ph.D. (2014) degrees in Computer Science, all from the University of Kansas (KU). As a graduate student at KU, he became interested in research topics in compilers and runtime systems. In 2012, he began collaborating with researchers at Intel Corporation to develop novel memory management techniques that enable applications to use memory more efficiently. His current research explores innovative system tools and techniques to bring about faster, safer, and more efficient execution of software on modern architectures.

During his time at KU, Dr. Jantz taught six semesters as an assistant for the Introduction to Operating Systems course. He also served for three years as President of the KU Beta Chapter of Upsilon Pi Epsilon, an honors society that promotes and rewards high scholarship in computing disciplines. His current teaching mission at the University of Tennessee is to make computing science, especially large and complex software systems, accessible to young students.

Position: Assistant Professor

Ph.D.: Computer Science, University of Kansas, Lawrence, KS, 2014

Research areas:
- Virtual Machines
- Operating Systems
- Compilers
- Program Optimization
- Performance and Power Efficiency
Dr. Andreas Koschan has made a lot of ‘border crossings’ in his life. He grew up on the western side of the Berlin wall in Germany. One little known fact is that those living on the western side could cross over into the east for family visits or things like conferences – though of course those in the east did not have this freedom. Travel has always been a big interest of his – his first big overseas trip as a graduate student was to Thailand, Malaysia, and Singapore, and he has since visited more than 45 countries on 6 continents and several islands.

In 2000 he made a long-term crossing over the Atlantic, when he left Berlin to come to the University of Tennessee. He spent several years here in the UTK Imaging, Robotics, and Intelligent Systems Lab pursuing research interests in 3D computer vision and digital image processing with an emphasis on safety and security related applications. The many research projects he worked on included video tracking of suspicious subjects in airport terminals, threat assessment for carry-on luggage inspection, reverse engineering of automotive parts, robot-controlled under-vehicle imaging for threat detection, and multispectral and 3D face recognition for person authentication. This research work was supported by several different agencies including the US Air Force, the US Army, the US Navy, the Missile Defense Agency, the Federal Aviation Administration, and the Department of Energy.

Position: Professor of Practice
Hometown: Berlin, Germany
Ph.D.: Computer Engineering, Technical University Berlin, Germany, 1991
Research areas:
- Surveillance and tracking using video and thermal sensors
- Sensor fusion
- Opportunistic sensing
- Urban scanning
- Nano-vision
- Microscopic imaging
- Biometrics
- 2D and 3D face recognition
- Sensor placement
- Industrial inspection
- Homeland security

Hobbies: Travel, photography

Dr. Donatello Materassi holds a Laurea in “Ingegneria Informatica” and a “Dottorato di Ricerca” in Electrical Engineering/Nonlinear Dynamics and Complex Systems from Università degli Studi di Firenze, Italy. He has been a post-doctoral researcher at University of Minnesota (Twin Cities), a post-doctoral fellow at Laboratory for Information and Decision Systems (LIDS) at the Massachusetts Institute of Technology and a lecturer at Harvard University.

Dr. Materassi’s main thrust of research is the development of a general theoretical framework for the reconstruction of networks of dynamical systems. His main results are based on filtering techniques and have drawn fundamental connections between standard graphical models, control theory and signal processing. He is currently working on extending this theoretical framework in order to deal with the presence of latent nodes, feedback loops and time-varying structures. Applications are in quantitative finance, gene and multi-agent networks.

Dr. Materassi is also currently working on the introduction of methodologies developed in the area statistical mechanics to the area of classic control theory and communication engineering. Applications are going to be in power systems, sensor networks and cognitive radio.

Position: Assistant Professor
Ph.D.: Università degli Studi di Firenze, Florence, 2007
Research areas:
- Stochastic Systems
- System Identification and Modeling
- Graphical Models
- Cybernetics
Dr. Audris Mockus is the Ericsson-Harlan Mills Chair Professor in the Department of Electrical Engineering and Computer Science of the University of Tennessee. He received bachelor’s and master’s degrees in applied mathematics from the Moscow Institute of Physics and Technology in 1988, and a master’s degree in 1991 and a Ph.D. in statistics from Carnegie Mellon University in 1994.

He studies software developers’ culture and behavior through the recovery, documentation, and analysis of digital remains. These digital traces reflect projections of collective and individual activity. He reconstructs the reality from these projections by designing data mining methods to summarize and augment these digital traces, interactive visualization techniques to inspect, present, and control the behavior of teams and individuals, and statistical models and optimization techniques to understand the nature of individual and collective behavior. He also continues to work part-time at Avaya Labs Research.

Previously he worked in the Software Production Research Department at Bell Labs. He is a member of the IEEE and ACM. Dr. Mockus was born in Kaunas, Lithuania. His father still teaches at Vilnius University, where his specialty is Global Optimization, and his mother has a PhD in Economics and also has worked extensively with Geographic Information Systems.

In high school, Dr. Mockus was into physics, and even placed second in the Lithuanian Physics Olympiad. After graduating, he attended the Moscow Institute of Physics and Technology, which he says was the best school at the time in the Soviet Union, and perhaps even now in Russia. Three years of intense physics and math were followed by three years of working on what would be considered a masters thesis at the Computing Center of the Academy Of Sciences.

When he was looking for a Ph.D. program, the Iron Curtain had just fallen, and Dr. Mockus was able to attend Carnegie Mellon University. His thesis was a videotape showing the dynamics of the disease mumps in the United States over a 20-year period.

He worked on a number of other projects, including fMRI (functional magnetic resonance imaging), image layout and aircraft traffic. He joined AT&T Bell Labs in 1995 and worked for a software production research department. While there, he became fascinated with reconstructing software development and other human activities from digital traces they leave as they work and play, which he calls Digital Archeology.

He says that there is a huge interest now in using similar data that is available from many different sources. He also says, however, that many potential pitfalls exist for anyone who tries to use that data. He designed his Digital Archaeology course to address the issue and to better educate students in this area. He is very curious and eager to understand and theorize how everything works; he says that even simple things tend to be much more complicated than we may think.

Position: Harlan Mills Chair Professor

Hometown: Kaunas, Lithuania


Research areas:
- Software Engineering
- Data Science
- Digital Archaeology

Hobbies:
- Skiing, hiking, kayaking, listening to opera and classical music
Dr. Hector A. Pulgar is an Assistant Professor in the Department of Electrical Engineering and Computer Science at the University of Tennessee Knoxville. He received his Ph.D. in Electrical Engineering at the University of Illinois at Urbana-Champaign in 2010. In 2001, he initiated his academic career as an Academic Instructor at the Universidad Técnica Federico Santa María (UTFSM), Chile. He taught more than fourteen subjects of the electrical engineering curriculum, such as electric circuit theory and power system modeling and analysis. After receiving his Ph.D., Dr. Pulgar also focused on graduate courses, emphasizing conventional and non-conventional generator dynamic modeling, governors-AVR-PSS modeling, small signal stability, frequency excursions and bifurcations analysis. He has been awarded a FONDECYT/Iniciacion grant from the Chilean Government related to wind farms modeling and analysis and also various UTFSM's grants. His research interests include power systems dynamics and stability, power system operation and control, renewable energy integration, energy storage systems, wind farm modeling, voltage collapse and bifurcation analysis.

Dr. Pulgar is a member of the NSF Engineering Research Center - CURENT, the Center for Ultra-wide-area Resilient Electric Energy Transmission Networks.

Position: Assistant Professor

Home Country: Chile

Ph.D.: Electrical Engineering, University of Illinois at Urbana-Champaign, 2010

Research areas:
- Power system dynamics and stability
- Power system operation and control
- Renewable energy integration

Dr. Garrett Rose is an Associate Professor in the Department of Electrical Engineering and Computer Science at the University of Tennessee, Knoxville where his research is focused in the areas of nanoelectronic circuit design, neuromorphic computing and hardware security. Prior to joining the University of Tennessee, Dr. Rose was a Senior Electronics Engineer with the Air Force Research Laboratory (AFRL), Information Directorate, Rome, NY from July 2011. While with AFRL, he led a variety of research efforts in the areas of hardware security and nanocomputing. As with his current research, these efforts were particularly focused on understanding potential security vulnerabilities and strengths in nanoelectronic computing systems. From August 2006 to May 2011, he was an Assistant Professor in the Department of Electrical and Computer Engineering at the Polytechnic Institute of New York University, Brooklyn, NY where he taught courses in the area of VLSI circuit design. His Ph.D. dissertation was on the topic of circuit design methodologies for molecular electronic circuits and computing architectures.

Dr. Rose is a member of the Association of Computing Machinery, IEEE Circuits and Systems Society and IEEE Computer Society. He serves and has served on Technical Program Committees for several IEEE conferences (including ISCAS, GLSVLSI, NANOARCH) and workshops in the area of VLSI design. In 2010, he was a guest editor for a special issue of the ACM Journal of Emerging Technologies in Computing Systems that presented key papers from the IEEE/ACM International Symposium on Nanoscale Architectures (NANOARCH’09). Since April 2014, he has been an associate editor for IEEE Transactions on Nanotechnology.

Position: Associate Professor

Ph.D.: Electrical Engineering, University of Virginia, Charlottesville, VA, August 2006

Research areas:
- Nanoelectric Circuit Design
- Memristors and Memristive Systems
- Emerging Nanoelectronic Computer Architectures
- Hardware Security and Security Implications of Emerging Computing Systems
Dr. Chao Tian received a bachelor’s degree in Electronic Engineering from Tsinghua University, Beijing, China, in 2000 and has a master’s degree and Ph.D. in Electrical and Computer Engineering from Cornell University, Ithaca, NY in 2003 and 2005, respectively.

Dr. Tian was a postdoctoral researcher at Ecole Polytechnique Federale de Lausanne (EPFL) from 2005 to 2007, and then a researcher at AT&T Labs-Research (Shannon Labs) in New Jersey from 2007 to 2014. He was also an Adjunct Associate Professor at Columbia University between 2009 and 2013, and an Associate Editor for the IEEE Signal Processing Letters between 2012 and 2014. He joined the EECS department of the University of Tennessee, Knoxville, as an associate professor in 2014.

His research interests include data storage systems, information theory, data communication and networks, joint source-channel coding, as well as image/video coding and processing.

Dr. Tian received the Liu Memorial Award at Cornell University in 2004, and the AT&T Key Contributor Award multiple times while he was with AT&T Labs-Research.

Position: Associate Professor
Ph.D.: Electrical and Computer Engineering, Cornell University, 2005
Research areas:
• Data storage systems
• Information theory
• Data communication and networks
• Signal processing

Dr. Yan Xu has broad working experience in power systems, including utilities, digital relay protection manufacturing, and electric train manufacturing in China after receiving her Bachelor’s and Master degrees. She has been working at Oak Ridge National Laboratory (ORNL) for more than 8 years since she received her Ph.D. in Electrical Engineering from the University of Tennessee.

Dr. Xu is now the Eastman Professor of Practice in Electrical Engineering, and a part-time researcher at ORNL as well.

The Eastman Professor of Practice is a new professorship made possible as part of a commitment by Eastman of $2 million over a five-year period. This commitment also includes providing for two additional Professor of Practice positions, as well as construction, renovation and improvement in some College of Engineering lab space and buildings.

Honors & Affiliations:
• Research staff, Oak Ridge National Laboratory
• Senior Member, IEEE
• Member, IEEE Power and Energy Society, IEEE Power Electronics Society

Position: Eastman Professor of Practice
Ph.D.: Electrical Engineering, University of Tennessee, 2006
Research areas:
• Power systems and power electronics, including utility applications of power electronics
• Renewable energy integration
• Smart grid, microgrid, communication, control, protection, and energy management of power systems.
Joseph Waynick Bray - Non-thesis MS  
Advisor: W. Gao

Bryan Andrew Burke - Minimal-density, RAID-6 Codes: An Approach for \( w = 9 \).  
Advisor: J. Plank

Jidong Chai - Non-thesis MS  
Advisor: Y. Liu

Mark Blaise Decotes - Data Analytics Of University Student Records.  
Advisor: J. Huang

Kevin Michael Dowling - Hardware-In-Loop Evaluation of Microgrid Protection Schemes.  
Advisor: L. Tolbert

Cory Lynn Fandrich - An On-Chip Transformer-Based Digital Isolator System.  
Advisor: B. Blalock

Peter Stanley Gaultney - Non-thesis MS  
Advisor: J. Dongarra

Ali Ramzi Ghezawi - Non-thesis MS  
Advisor: D. Birdwell

Jiahui Guo - Non-thesis MS  
Advisor: Y. Liu

Morgan Lucas Helton - Non-thesis MS  
Advisor: D. Birdwell

Nathan Lee Henry - Improved Forensic Medical Device Security through Eating Detection.  
Advisor: G. Peterson

Lucas Antonio Herrera - A Novel Authentication Method Using Multi-Factor Eye Gaze.  
Advisor: D. Birdwell

Qinran Hu - Non-thesis MS  
Advisor: F. Li

Brandon Jeffrey Johnson - An Occupant-Based Dynamic Simulation Tool for Predicting Residential Power Demand and Quantifying the Impact of Residential Demand Response.  
Advisor: L. Tolbert

Gefei Kou - Non-thesis MS  
Advisor: Y. Liu

Matthew Ian Laurence - A SiGe BiCMOS LVDS Driver for Space-Borne Applications.  
Advisor: B. Blalock

Sang Hyeb Lee - Non-thesis MS  
Advisor: J. Gregor

Yalong Li - Arm Inductance and Sub-Module Capacitance Selection in Modular Multilevel Converter.  
Advisor: F. Wang

Jilong Liao - A Privacy-Aware Distributed Storage and Replication Middleware for Heterogeneous Computing Platform.  
Advisor: Q. Cao

Advisor: H. Qi

Advisor: A. Fathy

Daniel Leon Maiherhafer - Non-thesis MS  
Advisor: B. Blalock

Taylor Leigh Morris - Non-thesis MS  
Advisor: J. Plank

Advisor: S. Djouadi

Advisor: F. Li

Nicole Marie Pennington - Non-thesis MS  
Advisor: L. Parker

William Edward Pierce - Non-thesis MS  
Advisor: J. Plank

Advisor: J. Holleman

David Grantham Prenshaw - Non-thesis MS  
Advisor: B. Vander Zanden

Joshua Michael Pyle - Graphics Processing Unit Bloom Filters: Classical and Probabilistic.  
Advisor: Q. Cao

Alexander James Saites - Non-thesis MS  
Advisor: I. Arel

Hira Amna Saleem - Microgrid Modeling and Grid Interconnection Studies.  
Advisor: K. Sun

Chad Eric Seaver - An Implantable Low Pressure Biosensor Transponder.  
Advisor: J. Holleman

Carl Douglas Slater - Non-thesis MS  
Advisor: J. Gregor

Logan Smith Taylor - Non-thesis MS  
Advisor: S. Islam

Benjamin Brady Taylor - Non-thesis MS  
Advisor: L. Parker

Yue Tong - Non-thesis MS  
Advisor: J. Sun

Nicholas Owen Vinson - Non-thesis MS  
Advisor: G. Peterson

Haoyu Yuan - Non-thesis MS  
Advisor: F. Li
Edmon Begoli
Procedural-Reasoning Architecture for Applied Behavior Analysis-based Instructions.
Advisor: B. MacLennan

Shuping Gong
Advisor: H. Li

Li He
Bayesian Dictionary Learning for Single and Coupled Feature Spaces.
Advisor: H. Qi

Hao Huang
Advisor: F. Li

Yong Liu
Wide-area measurement and applications in power system dynamic modeling and control.
Advisor: Y. Liu

Guodong Liu
Generation Scheduling for Power Systems with Demand Response and a High Penetration of Wind Energy.
Advisor: K. Tomsovic

Junjie Lu
Advisor: J. Holleman

Jiajia Luo
Feature Extraction and Recognition for Human Action Recognition.
Advisor: H. Qi

Zhibo Wang
Barrier Coverage in Wireless Sensor Networks.
Advisor: H. Qi

Bailu Xiao
Cascaded Inverters for Grid-Connected Photovoltaic Systems.
Advisor: L. Tolbert

Fan Xu
All-SiC Three-Phase Converters for High Efficiency Applications.
Advisor: L. Tolbert

Zhuxian Xu
Development of Si Device Based Power Converters for High Temperature Operations in HEV Applications.
Advisor: F. Wang

Jing Xue
High Density EMI Filter Design in High Power Three-Phase Motor Drive Systems.
Advisor: F. Wang

Yanjun Yao
Advisor: Q. Cao

Quan Yuan
In-Line Microfluidic Particle Preconcentrator and Detector for Continuous Flow Monitoring.
Advisor: J. Wu

Hao Zhang
Advisor: L. Parker
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