Message from the Interim Chair

B. Earl Wells, Ph.D., P.E.

A major goal of the faculty and staff of the ECE Department at UAH has always been to establish an environment that will continuously generate new engineers and researchers who will remain active contributors throughout their careers to the ever-changing technological landscape.

Change, however, is not restricted to technology but affects all aspects of life. It has been said that he/she who rejects change is the architect of decay.

The ECE Department itself is now experiencing a period of great change. The primary catalyst for this change has been the recent retirement of four of our full time faculty members during the 2014 academic year. At the same time we have been performing an aggressive international search for new ECE faculty members at various levels of experience to carry us into the future. I am happy to say that this search has been very fruitful and we have hired three new faculty.

Our new Department Chair is Dr. Ravi Gorur who is an internationally acclaimed expert in power engineering. He is an IEEE Fellow. His current and emerging research has the potential to augment existing departmental expertise in such areas as Controls, Signals and Systems, and Computer Engineering. Ravi also has had much administrative experience both in academia and industrial research. Ravi’s plans include building a high voltage dielectrics laboratory for studies on materials used in electric power delivery. I am indeed excited that he has agreed to come on board and lead. Ravi will be building a high voltage dielectrics research laboratory that will include experimental and computational capabilities for research on materials and systems used for electric power delivery.

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Message from the New Chair

Dr. Ravi Gorur, Ph.D

“Engineers solve real-life problems. Human civilization has continuously sought to find more efficient solutions, consequently engineering is a profession always in demand. Today it is commonplace to see computers with high resolution screens everywhere - in our cars, homes, offices and industry; and their operation, as is our high standard of living that we have taken for granted depends on high quality, affordable, reliable and secure electricity. And this is precisely what we teach our students in the ECE Department. The luxury of having programs in electrical, computer and optical engineering in one department is something not found in many universities. Being in the Huntsville area that is abundant with high-tech industry serving the nation’s defense and civilian operations is a tremendous advantage for our students. ECE faculty work very closely with them on exciting research projects and this ensures that our students are highly sought after upon graduation.”

Dr. Ravi Gorur joins the Electrical and Computer Engineering Department at UAH as Professor and Department Chair. Dr. Gorur graduated with the Ph.D Degree in Electrical Engineering from the University of Windsor, Canada in 1986. He joined the Electrical and Computer Engineering Department at Arizona State University in 1987 as an assistant professor, became a full professor in 1995, Director of Undergraduate Studies in 2006 and Program Chair of the Electrical Engineering Program in 2010. He was named IEEE Fellow in 1998 for his contributions in the field of polymeric materials for outdoor insulation. In 2011, he received the Claude de Tourreil lifetime achievement award for contributions to the field of outdoor insulators.

During May 2013-May 2014, he was on an IPA (Inter-government Personnel Act) assignment at the US Department of Energy where he served as the Deputy Assistant Secretary of The Power Systems Engineering R & D division in the Office of Electricity Delivery and Energy Reliability, where he was responsible for research in three major areas: smart grid, energy storage and cybersecurity for energy delivery.

During his career, Ravi has supervised numerous research projects sponsored by the government, utilities and industry in the field of electrical insulation and has coauthored a textbook and over 200 papers.
2015 Paul Michael Salmon Outstanding ECE Engineering Design Award Winners

The Paul Michael Salmon Outstanding Engineering Design Award has been given once a year by the ECE Department to honor Paul Michael Salmon and his extraordinary determination, quest for excellence and his unquenchable spirit. This year’s award winners were selected by the ECE faculty with input from the Salmon family and external industrial representatives from the 30+ distinct senior design projects that were conducted in the Electrical, Computer, and Optical Engineering Senior Design courses during the 2014/2015 academic year.

First Place -- Camera–Phone Based Optical Metrology System
Hal Lee, Kevin Percey, Mason Manning
This project focused on the design, creation, and verification of a lens characterization apparatus that employs simple commercially-off-the-shelf components to perform Optical Metrology.

Second Place -- Project RISE – Automated Autonomous 3D Floor Plan Generator
Jesse Hairston, Atley Troyer, George Mitchell
This project was to develop a product with the capability to autonomously construct a viewable 3D mesh of the interior of a building using a rover-mounted LIDAR scanning system.

Third Place – UAH Solar Power Charging Bench
Patrick Doyle, Donna Baughn, Beverly Martin
This project was to develop a safe, robust and sustainable outdoor solar charging station that would support the charging of a wide range of modern portable electronic devices without the need to be connected to a traditional commercial power grid. The station is located in front of the UAH Engineering Building.

Special Thanks go out to Adtran, Lockheed Martin, Jacobs, and TVA for their sponsorship and technical mentorship of many of this year’s ECE senior design projects!
(Continued from Page 1)

Dr. Tommy Morris has been hired as an Associate Professor of ECE and as the founding director of UAH’s new Cybersecurity Center for Research and Education. Tommy’s area of expertise lines up well with the major technical thrusts of UAH as well as many of the research interests of other ECE faculty members in Computer Engineering. In addition to academic rigor, Tommy brings with him a wide range of industrial experience. Tommy wants to build a pipeline of research that provides trained scientists and engineers to work at Redstone and at local companies. He wants UAH to be an increasingly important spoke in the cyber-city wheel.

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Dr. Thomas Morris, Ph.D.  Associate Professor & Director of the Center for Cybersecurity Research and Education (CCRE)

Dr. Tommy Morris joins the Electrical and Computer Engineering Department as Associate Professor. In addition Dr. Morris will serve as the founding director of the Center for Cybersecurity Research and Education (CCRE) at UAH. He previously served as Associate Director of the Distributed Analytics and Security Institute (DASI) and Associate Professor of Electrical and Computer Engineering at Mississippi State University (MSU). He also served as director of the MSU Critical Infrastructure Protection Center (CIPC) and as a member of the MSU Center for Computer Security Research (CCSR). Prior to joining MSU, Dr. Morris worked at Texas Instruments (TI) for 17 years in multiple roles including circuit design and verification engineer, applications engineer, team leader, and program manager.

Tommy received his Ph.D. in Computer Engineering in 2008 from Southern Methodist University in Dallas, TX. His primary research interests include cybersecurity for industrial control systems and electric utilities and power system protective relaying. His recent research outcomes include vulnerability and exploit taxonomies, intrusion detection systems, virtual test beds, and a relay setting automation program used by a top 20 investor owned utility. Tommy has authored more than 40 peer reviewed research conference and journal articles in these areas. Dr. Morris’s research projects are funded by the National Science Foundation, Department of Homeland Security, Pacific Northwest National Laboratory, NASA, the US Army Corps of Engineers Engineering Research Development Center (ERDC), Pacific Gas and Electric Corporation, and Entergy Corporation.

New Masters of Science in Cybersecurity (MSCBS) Degree Offering

The Electrical and Computer Engineering is an interdisciplinary participant in the newly created Masters of Science in Cybersecurity (MSCBS) degree. This graduate degree is designed to give graduate students the skills necessary to secure and defend computer networks, recover from security failures, use computer forensics and manage data security. The Engineering track is being administered by the Electrical and Computer Engineering Department. Please contact Dr. Tommy Morris at tommy.morris@uah.edu for more information.
**Student Outreach Programs**

**Tech Trek 2015**

**Dr. Rhonda Gaede**, Associate Professor in the ECE Department, was Camp Director of this year’s Tech Trek Program. This program, held from June 21 to June 27, 2015, was a weeklong residential camp at UAH that featured intensive hands-on experiments and activities to promote interest in the science, technology, engineering, and math (STEM) fields among rising eighth-grade girls. The program is sponsored by the American Association of University Women (AAUW).

This year’s participants included 65 girls from across the state of Alabama that was selected from a pool of 160 nominees. Dr. Gaede said, “The planning committee worked hard to expand the reach of the Tech Trek program.” In 2014, we had girls from 5 counties; this year, 15 counties and 41 schools are represented. In future years, we may have multiple weeks of camp if we can continue to expand our funding base.”

The camp's curriculum was comprised of morning and evening activities, several field trips, and a Professional Women's Night. Employees of AAUW's Tech Trek partner Lockheed Martin will also provide volunteer support, serving as role models for the campers. Research shows that girls who see successful women in STEM careers can overcome the negative stereotypes sometimes associated with those jobs.

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**The BEST Experience**

ECE faculty member **Dr. Jennifer English**, Associate Professor and Associate Dean for Undergraduate Education, served as director of the UAH College of Engineering’s BEST week-long residential camp for high school students which was held at UAH from June 21 to June 27. The BEST program was designed to introduce students to engineering education in a fun and engaging way. Participants attended engineering classes, performed hands-on experiments in engineering labs, participated in UAH student life activities, met with UAH professors, worked on project teams, and lived in the residence halls.

The BEST Experience allowed rising high school students grades 11 through 12 students to explore different types of engineering and aspects of design, build, and test—all while living like college student. “The idea behind the BEST Experience is to put engineering tools and experiments into the hands of high-school students such that they can learn what engineering at a university is like. We want them to see for themselves that majoring in engineering is very rewarding, challenging, and fun,” said Dr. English.

This year’s program attracted over 60 student participants. It was sponsored by several Huntsville companies including Dynetics, Parker Hannefin, and Northrop Grumman. Other sources of funding include NSF EPSCoR and UAH.
Dr. Maria Pour joins us as an Assistant Professor. Her area of research is antennas. She has a passion for research and a heart for teaching. She plans to build antenna laboratories that are pivotal to enrich both undergraduate and graduate curricula in antennas and applied electromagnetics for education and research. The laboratories will have an RF generator, different antenna types, receiving and transmitting systems. The research laboratory will be an anechoic antenna chamber, capable of measuring three-dimensional antenna radiation patterns and their scattering parameters. It facilitates antenna design and characterization for radars, atmospheric research, microwave remote sensing, and wireless communication systems.

It has been an honor to serve as Interim Chair. Thank you all for the support you have given me. I look forward to support Ravi and the rest of the ECE faculty as we transition into the future!

Dr. Maria Pour, Ph.D. Assistant Professor

Dr. Maria Z. A. Pour joins the Electrical and Computer Engineering Department as Assistant Professor. Dr. Pour received her Ph.D. and M.Sc. degrees from The University of Manitoba in 2012 and 2006, respectively, and her B.Sc. degree from Sharif University of Technology in 1997, all in Electrical Engineering. Prior to joining The University of Alabama in Huntsville, she was a Research Associate and Assistant Director with the Antenna Laboratory at The University of Manitoba in Winnipeg, Manitoba, Canada.

Maria’s research interests are in the areas of antennas, applied electromagnetics and remote sensing. In particular, her research is focused on antenna theory, design and analysis. This includes reflector antennas and feeds, phased array antennas, wideband and UWB antennas, virtual aperture antennas, multi-mode antennas, dual-polarized dual-band antennas for remote sensing, and antenna measurement techniques. In addition, she has a keen interest in computational electromagnetics and engineering conductors for antenna miniaturization and microwave components.

Recent Students / Alumni Activities

Three ECE Ph.D. students from UAH earned top honors for their poster presentations at the 2015 Science & Technology Open House, held at the Renaissance Hotel in Montgomery, Alabama.

Abubaker Tareki took home first prize and a cash award of $1000 for his poster, "Enhancing Nano/Bio Sensors in the Terahertz Regime via Research in Tunable Metamaterials Using Liquid Crystals." "It was really great to have the opportunity to present my research work and to represent UAH," said Tareki of the experience. "I was pleased that my research was recognized by the judges. I want to thank everybody at UAH for their support and help, and in particular, my advisor Dr. Robert Lindquist and Dr. Junpeng Guo."

Seyed Sadreddin Mirshafieyan took home second prize and a cash award of $800 for his poster, "Optical Colors and Perfect Light Absorption in Silicon Nanostructures." And William Gaillard took home third prize and a cash award of $600 for his poster, "Microfluidic Reactor Development for Oligonucleotide Synthesis."

ECE Graduate Students win Major Awards at 2015 Science and Technology Open House

More than 110 students at both the undergraduate and graduate level from nine Alabama counties took part in the competition, which was judged by representatives from over 17 industries.

The Open House was funded by a National Science Foundation Research Infrastructure Improvement award, ALEPSCoR is a statewide consortium of multiple institutions dedicated to establishing a nano/bio science and sensor research and education infrastructure in Alabama.

UAH ECE Real Time News (Continued from Page 3)
Recent ECE Graduate Students Initiatives

Protecting fly-by-wireless systems from remote attacks - 8th Werner von Braun Memorial Symposium, 2015: Vahid Heydari, MSE
Student working with Prof. Sam Yoo

Fly-by-wireless systems use wireless sensor networks connectivity in aircraft for weight reduction, ease of maintenance and increased monitoring capability. Wireless networks can be accessed by an attacker inside the aircraft. Using wireless internet connection between the aircraft and a ground station creates more security challenges as a remote attack can be started from the ground. A moving target defense system has been developed that dynamically changes the address of the flight control computer to block remote attacks.

Student working with Prof. Emil Jovanov

Time synchronization is an important issue for distributed monitoring systems. A hybrid sensor network (HSN) is formed by combining wired and wireless sensors, and is the architecture of choice due to ease of deployment and configuration. This project involved the development of a distributed sleep monitoring system that combines wireless inertial sensors which is controlled by a custom smartphone app. Existing sleep activity monitors are wired to the monitor. The use of wireless sensors improves the user’s comfort during sleep. The system developed facilitates sleep studies and clinical diagnosis of insomnia. The work was supported in part by Qatar National Research Fund grant.


Oligonucleotides (oligos) are commercially available short DNA or RNA molecules with a wide range of functions in genetic testing, antisense therapy, artificial gene synthesis, DNA amplification, DNA sequencing, as molecular probes, and in forensics. The impact of this work is to reduce the production cost of oligos for research and commercial applications by a factor of 50. The result of this research effort is a reusable glass micro reactor and a commercialized tabletop workstation capable of generating 100 - 200 pmols of high purity customer specified oligos required to synthesize short chain DNA, complex transmembrane proteins, site specific proteins, and user generated proteins not otherwise found in nature. This work was supported by the State of Alabama’s Graduate Scholars Research Program, UAH and Oblique Bio Inc., Huntsville, Alabama.
Recent ECE Faculty Research Initiatives

Dr. David Coe  Dr. Jeff Kulick  Dr. Alex Milenkovic

Research in Design–phase Cybersecurity

ECE faculty members Drs. David Coe, Jeff Kulick, and Aleksandar Milenkovic are teaming with Dr. Letha Etzkorn and Dr. Sun-il Kim on a one year National Security Agency grant to develop a lightweight virtualization architecture that can be used to build cybersecurity into systems that are part of the so-called Internet of Things (IOT). The proposed architecture will move the inclusion of cybersecurity features forward, into the design process of the product. This research will leverage Dr. Kulick's and Dr. Coe's prior research on safety-critical systems, a domain where safety analysis must be infused throughout the system design and development process rather than layered on afterwards as security is currently practiced. This research also builds upon Dr. Milenkovic's prior work in embedded systems, hardware-software co-design, and secure processing. "While finding flaws and repairing them will continue to be an important focus in cybersecurity research, this proposal focuses on an architectural approach to building security into the system at the outset," says Dr. Coe, the project's principal investigator.

Smart Pill-Bottle and Smart Water-Bottle Invention

ECE faculty member Dr. Emil Jovanov earned Alabama Inventor of the Year honors last year for a smart pill bottle that can monitor the medication compliance of patients by tracking the number of pills taken and when they were consumed. The information can then be uploaded to the cloud, where medical personnel can track patient compliance. That device was licensed by a New York startup called AdhereTech, which is testing, developing and producing that technology. Dr. Jovanov is also working on a smart water bottle invention which has advanced to the final round in Alabama Launchpad Start-Up Competition. Launchpad promotes and rewards high-growth, innovative startups from across Alabama that are new, innovative ventures in the seed or early-growth stages, or existing businesses moving into a new high-growth market. Currently in the patent application process, the smart water bottle has electronic sensors to make it easy for users and medical personnel to track the amount of fluids consumed in a day. The information is automatically transmitted via the cloud to a smartphone or care facility network.
In Memory of Dr. Nagendra Singh, Distinguished Professor Emeritus

It is with a heavy heart that the ECE Department announces the passing of our distinguished colleague and friend Dr. Nagendra Singh. Dr. Singh has been a faculty member of the ECE Department since 1986 where he was an internationally known contributor to the fields of space plasma research, antennas, and computational electromagnetics. Dr. Singh authored 170 plus publications in refereed journals. He supervised the dissertations of nine PhD students at UAH. He received funding for his research from NASA and NSF. In 2009, UAH elevated him to the title of Distinguished Professor in recognition of his outstanding and sustained research contributions.

His work on a wide range of topics, such as antennas in space plasmas, double layers, large-scale plasma flow, and application of parallel computing to space plasma PIC codes, are all trend-setting in their respective fields.

Nagendra was known to spend many hours working one-on-one with new students and faculty researchers in order to explain the intricate concepts in space physics, plasmas and electromagnetic phenomena. His legacy will be felt for years to come. Nagendra was always a pleasure to work with. He will be greatly missed by all.

The Department is seeking to establish a Named Professor in honor of Dr. Singh. If you are interested in making a donation to this worthy cause, please contact UAH’s Office of Development at (256) 824 4123.