

## Department of ELECTRICAL & COMPUTER ENGINEERING

COLLEGE OF ENGINEERING

550 to 15



2022

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# A MESSAGE FROM **DR. TOMMY MORRIS**

My name is Tommy Morris. As of January of 2022, I am serving as the Interim Chair of the UAH Department of Electrical and Computer Engineering (ECE). I also serve as an Eminent Scholar of Computer Engineering and Director of the UAH Center for Cybersecurity Research and Education. In addition to my new role, Dr. Laurie Joiner is also currently serving as the Interim Associate Department Chair (pictured above).

I would like to thank Dr. Ravi Gorur, past Chair, and Dr. Rhonda Gaede, past Associate Chair, for their service to the Department. Both contributed a great deal to the department, including leadership as ECE successfully completed two ABET accreditation cycles, hired five new faculty and four new staff members, added a B.S. in Cybersecurity Engineering, and sunset the B.S. in Optical Engineering program.

This is an exciting time for ECE and I see a bright future ahead. ECE offers three degrees at the undergraduate level (Electrical, Computer, and Cybersecurity Engineering), four at the Masters level (Electrical, Computer, Cybersecurity, and Software Engineering), and two at the Ph.D. level (Electrical and Computer Engineering). The classrooms are full at all levels and we are graduating some of the brightest minds around. Our graduates are changing the world, writing code and designing hardware for next generation helicopters, unmanned aircraft, and satellites, securing cyber physical systems and computers, and developing next generation robotics, radar, and communications technologies.

As of the fall 2021 term, ECE had a total of 904 students which makes ECE the third largest department on campus. We are currently in the hiring process for three new tenure track faculty members, one associated with each degree program.

We are especially proud of our researchers at all levels, undergraduate and graduate students, and faculty members. One notable accomplishment is Dr. Ray's recent National Science Foundation CAREER award. This is one of the hardest grants to win in academia. We are proud to have not one but three NSF CAREER award winners on our faculty as Dr. Pour and Dr. Liu are also recent winners. Finally, we are very happy to announce that UAH has just achieved Carnegie Foundation Very High Research Activity status. This is the highest level of research activity at universities in the United States. Research leads to state-of-the-art advances in engineering and having these great faculty and their very worthy colleagues at UAH leads to state-of-the-art knowledge in our classrooms.

Welcome to the future. Send your best and brightest to UAH ECE!

Sincerely,

#### Dr. Tommy Morris

Interim Chair of the UAH Department of Electrical and Computer Engineering

# ECE FACULTY



**DR. JENNIFER ENGLISH** 

Associate Dean of Undergraduate Affairs, Associate Professor



**DR. LAURIE JOINER** 

Associate Department Chair, Associate Professor



**DR. THOMAS MORRIS** 

Interim Chair, Eminent Scholar of Computer Engineering, Director of CCRE



DR. RHONDA KAY GAEDE

Interim Associate Provost, Associate Chair & Professor



TIMOTHY A. CARVER

Lecturer



**DR. DAVID COE** Associate Professor



DR. RAVI GORUR



DR. JUNPENG GUO Professor







DR. JIANQING LIU DR. ALEKSANDAR MILENKOVIC DR. DAVID PAN

Assistant Professor

Professor

Associate Professor



**DR. MARIA POUR** Associate Professor



DR. FATHI ALDUKALI

Lecturer



DR. AUBREY N. BEAL





MR. RON BOWMAN Senior Lecturer



DR. TIMOTHY BOYKIN Professor



MR. DENNIS HITE



DR. FAT DUEN HO

Professor



DR. EMIL JOVANOV Professor



**DR. ROBERT LINDQUIST** 

Interim Provost, Executive VP for Academic Affairs, Professor



**DR. BISWAJIT RAY** Assistant Professor



DR. EARL WELLS, P.E.
Professor



DR. SEONG-MOO YOO Associate Professor

## **SENIOR** DESIGN PROJECTS

#### Soil Sage by Over Built & Under Paid

Team Members: Ken Nevins, Hunter Hose, Aeron Moran, Benjamin Paris Faculty Advisor: Mr. Dennis Hite

This project is about taking measurements in the soil, namely amounts of Nitrogen, Phosphorus, and Potassium, as well as temperature and moisture through a set of sensors. The unit is self-powered by a solar panel and dual 6-volt batteries. This device allows for gardeners and farmers to monitor nutrient levels to account for things such as crop rotation, optimal plants, and excessive or lacking amounts of certain nutrients. These levels are then displayed through a custom-made GUI implemented through Bluetooth connectivity.



#### LIDAR Mapping Module by Electric Boogaloo

Team Members: Anthony Peebles, Brandon Peterson, Michael Fuell, John Green Faculty Advisor: Mr. Dennis Hite Project Sponsors: Tennessee Valley Authority

The goal of this project is to generate 2-D mapping data of environments that the Modular Remote Vehicle (MRV) payload drives through. The LIDAR Mapping Module (LMM) gathers the data and stores it on the module's internal SD card. The project also uses three sensors to help determine direction of rotation and get a better resolution in data. After the data is collected, it is then recovered by a postprocessing script developed by the team. This project helps automated detection and processing of physical obstacles, which will be vital to both automated vehicles and even robots.



#### Alabama Smart Farm

Team Members: Evan Coy, Austin Fox, Orif Negmatov, Joshua Rencher, Christina Stovall Faculty Advisor/Sponsors: Mr. Dennis Hite, Dr. Biswajit Ray, Dr. Aleksandar Milenkovic

This project fills in a need for agriculture in the form of remote, low-power embedded sensing networks. It uses a sensor to monitor soil conditions such as humidity, pressure, and moisture levels. The Smart FARM also allows for wireless communication between different multiple nodes placed around the farm or garden. It also provides the groundwork for other specialized sensors to take different measurements like chemical sensors.



## **SENIOR** DESIGN PROJECTS

#### The Personal PCR Machine

Team Members: Peter Sizemore, Richard Compton, Hunter Hill, Ben Tran Faculty Advisors/Sponsors: Mr. Dennis Hite, Dr. Aubrey Beal, Dr. Joseph Ng

This student project is focused on creating a Polymerase Chain Reaction (PCR) machine, which is commonly used to amplify DNA to help testing for certain viruses. Most are large and/or expensive, so the goal of this project was to create a machine that costed much less, was more mobile, and helped to detect samples of COVID-19. Using a spectrometer and a halogen light bulb, the device compares different light wavelengths and determines whether samples appear at a specific wavelength to indicate positive or negative samples.



#### **Alzheimer's Disease TEMT Device**

Team Members: Jaden Flint, Steven Gallagher, Austin Mann Faculty Advisors/Sponsors: Mr. Dennis Hite, Dr. Aubrey Beal Project Sponsors: Mr. Kannan Grant

This project attempts to test a new hardware treatment for Alzheimer's Disease. The design is based on an open-source patent, but the implementation here is created with all commercially available parts. Using the RF signal provided by the voltage-controlled oscillator, the Raspberry Pi and a switch chooses an antenna to emit said signal and break down proteins that would contribute to this disease. With this non-medicinal design, patients have less of a need for prescription medications and would allow the treatment to work in the comfort of their home.



#### **Chaotic RNG Circuit**

Team Members: Austin Davis, Austin Handley, Kenny Brainerd, Jonathan Kuhn Faculty Advisors/Sponsors: Mr. Dennis Hite, Dr. Aubrey Beal Other Advisors: Dr. Ned Corron, Dr. Seth Cohen

Chaotic RNG Circuit's goal is to create a true random number generator. This is a departure from most random number generators, which use pseudo-random sequences, while the project's circuit can generate true randomness through simple circuitry. This is performed through a chaotic function, which relies on a deterministic system with a focus on initial conditions. This makes it more difficult to determine future outcomes without prior knowledge. The importance of this technology is quite great and allows for numerous security advantages.



# In Remembrance of Dr. Glenn Parker

#### GLENN A. PARKER, PH.D., P.E. 1969–2021

A principal research engineer and associate director of the Applied Systems Laboratory in the Georgia Tech Research Institute (GTRI), Dr. Parker also served as an adjunct instructor for the Electrical & Computer Engineering Department since Fall 2020. He was actively involved in the Institute of Electrical and Electronics Engineers (IEEE) and the National Council of Examiners in Engineering and Surveying (NCEES), both of which honored him with numerous awards.

He earned his Ph.D. in Electrical Engineering and Masters of Science in Mathematics from The University of Alabama in Huntsville. He was recognized as a Regents' Researcher by the University System of Georgia, a title for excellence in research, scholarship, and distinguished outreach.

Dr. Glenn Parker unfortunately passed away during the Fall 2021 semester. We would like to honor his commitments from his time here at UAH as a Former President of the Huntsville Chapter of IEEE and as an instructor, for which we are very grateful.



# **DR. LIU WINS** NSF CAREER AWARD

Dr. Jianqing Liu, an assistant professor in the ECE Department, recently garnered the Faculty Early Career Development (CAREER) Award, the most prestigious award given out by the National Science Foundation (NSF).

This award gives a \$500,000 grant "for junior faculty members who exemplify the role of teacher-scholars through outstanding research, excellent education and the integration of education and research."

"My CAREER project is to control and manipulate data errors in wireless devices using hardware and software co-design approaches," he says. Wireless devices devote many resources to error handling and control, and his topic of interest is to decrease the need for these resources.

His overall goal is to decrease the amount of error control and harness those errors as a new way for these security measures to become more localized and secure.

"On the other hand, data errors are not always harmful, but sometimes are benign or even beneficial. For instance, the fundamental idea of protecting security is through noise injection or encryption, whose intention is to corrupt and garble the original data. So, here comes the novel idea, can we relax the error control modules to permit certain data errors and meanwhile manipulate and turn them into good things in wireless devices?" says Dr. Liu.





With the assistance of his students Mr. Sopan Sarkar and Mr. Muhammad Umair as well as Professor Na Gong from the University of South Alabama, Dr. Liu has already developed prototypes that show "(1) how memory failures in low power can be turned into privacy-preserving noises; (2) how wireless channel erasure noises can be harnessed to carry additional information."

Dr. Liu is excited to continue researching and bringing more results to the scientific community and the Huntsville community at large.

# CONGRATULATIONS TO ALL! ECE DEPARTMENT 2021 MASTERS AND PH.D. GRADUATES

## **MASTERS** GRADUATES

**DELORES BAKER**, Electrical Engineering **Thesis:** A Low-Cost Energy Detection-Based Spectrum Sensing Algorithm with GNU Radio for Cognitive Radio **Advisor:** Dr. Laurie Joiner and Dr. Aubrey Beal

**FRANK BERISFORD III,** Electrical Engineering **Thesis:** Design and Analysis of a Fiber Optic Interconnect Using Gradient Index Diffractive Optics in Code V **Advisor:** Dr. Patrick Reardon

MATCHIMA BUDDHANOY, Electrical Engineering Thesis: Experimental Evaluation of Data Retention Characteristics of NAND Flash Memories Advisor: Dr. Biswajit Ray

AMIRAHMAD RAMEZANI, Computer Engineering Thesis: An Implementation of Embedded Software for Real Time Monitoring of Bioimpedance Advisor: Dr. Emil Jovanov

THOMAS SALVERSON, Electrical Engineering Thesis: Multi-Robot Slam Advisor: Dr. Nagavenkat Adurthi

**DEAN ALHORN, JR., Electrical Engineering MOHAMMAD ALIM, Computer Engineering RAPHAEL BARATA DE OLIVEIRA,** Cybersecurity Engineering **ELIZABETH BEKKEN, Electrical Engineering** NATHAN CORNELL, Electrical Engineering JOHN PAUL COX, Cybersecurity Engineering BRIAN DILLON, Electrical Engineering **KEVIN GILBERT, Computer Software Engineering DALLAS GUFFEY, Electrical Engineering STEVEN HILDEBRAND**, Cybersecurity Engineering **ASHTON JOHNSON, Computer Engineering** JORDAN JONES, Electrical Engineering **BRANDON LEACH, Electrical Engineering ALEX MITCHELL, Electrical Engineering ALEXANDRA MOSSER, Computer Engineering** DIPENKUMAR PATEL, Computer Engineering KYLE RAY, Computer Engineering WILLIAM SANDERS, Computer Engineering NATHAN SOWADA, Electrical Engineering JASON SPRADLING, Electrical Engineering JOSEPH WACHOB, Electrical Engineering

## Ph.D. GRADUATES

MOHAMMED ALFAYIZI, Electrical Engineering

**Dissertation:** Quad-Rotor Adaptive Sliding Mode Control Using Only Position and Yaw Sensors: Generalized Relative Degree Approach **Advisor:** Dr. Yuri Shtessel

JINNAN CHEN, Electrical Engineering Dissertation: Optical Thin-Film Metamaterials for Wideband Light Absorption Advisor: Dr. Junpeng Guo

**ELBASHER ELMAHDI,** Computer Engineering **Dissertation:** Secure Data Integrity in Wireless Ad Hoc Networks **Advisor:** Dr. Seong-Moo Yoo

**RANJAN HEBBAR,** Computer Engineering **Dissertation:** PMU-Events-Driven DVFS Techniques for Improving Energy Efficiency in Modern Processors **Advisor:** Dr. Aleksandar Milenkovic

**ZABED IQBAL,** Electrical Engineering **Dissertation:** Grating Lobe Reduction in Scanning Phased Array Antennas with Large Element Spacing **Advisor:** Dr. Marie Pour

**PREETI KUMARI,** Electrical Engineering **Dissertation:** Total Ionizing Dose Effects on the State-of-the-Art NAND Flash Memories with an Emphasis on Dosimeter Design **Advisor:** Dr. Biswajit Ray

PRAWAR POUDEL, Computer Engineering
 Dissertation: Exploiting Physical Properties of Flash Memories for Enhancing Security and Energy Efficiency of Embedded Systems
 Advisor: Dr. Aleksandar Milenkovic

SAI CHANDU RADAVARAM, Electrical Engineering Dissertation: Wideband Microstrip Patch Antennas with Radiation Pattern Reconfigurability Advisor: Dr. Maria Pour

MOHAMMAD SADMAN SAKIB, Electrical Engineering Dissertation: Hardware Security Primitives Using NAND Flash Memory Advisor: Dr. Biswajit Ray

ADITI SINGH, Electrical Engineering Dissertation: SER Analysis in Asynchronous Physical-Layer Network Coding System Advisor: Dr. Laurie Joiner

**BERNARD BILLY VATTEPU BENSON,** Electrical Engineering **Dissertation:** Modeling and Forecasting Methods in Heliophysics Utilizing Deep Neural Networks **Advisor:** Dr. David Pan

## SERVICE AWARD

#### Dr. Fat Duen Ho ELECTRICAL ENGINEERING PROFESSOR 40 Years of Service

Dr. Fat Ho marked 40 years of service at UAH in 2021. He joined the campus in 1980 and specializes in research of microelectronics devices, circuits and materials. He has authored or coauthored over 130 journal and conference papers/presentations. He works with graduate students on their research and has introduced a number of new courses through the department. He received the Outstanding Educator Award from the Huntsville section of IEEE in 2005.

We congratulate Dr. Ho on all of his achievements and contributions to the ECE Department.

# **SERVICE & FACULTY AWARDS**

These awards are in recognition of faculty who go beyond the ordinary requirements of their jobs. THANK YOU FOR MAKING A DIFFERENCE FOR OUR STUDENTS AND DEPARTMENT!



**Dr. Maria Pour** ASSOCIATE PROFESSOR

DR. JOSEPH C. DOWDLE ECE OUTSTANDING FACULTY AWARD



Mr. Dennis Hite SENIOR LECTURER

LINDA HOOPER ECE OUTSTANDING SERVICE AWARD



Dr. David Coe ASSOCIATE PROFESSOR

LINDA HOOPER ECE OUTSTANDING SERVICE AWARD

# **NEW** ECE STAFF



#### Annette Archer SENIOR STAFF ASSISTANT

Annette Archer, ECE's new Senior Staff Assistant, joined us in July 2021 from the UAH Housing Office. Annette has a true heart for students and has utilized that quality to take over the administration side of our graduate programs. A native of Australia, she's made her home here in Alabama. With husband and son engineers, she fits right into the ECE Engineering department and is focused on assisting students and faculty alike.

# WE WELCOME OUR NEWEST CHARGERS!

# Dr. Fathi Aldukali

Dr. Fathi Aldukali holds a Master of Science in Electrical and Microelectronics Engineering as of 2012, and graduated with a Master of Science and Ph.D. in Electrical Engineering from UAH in 2019. He also made the Dean's List at UAH in Spring 2019. His field of expertise mainly lies in research, with his main interests being automatic control systems, theory of nonlinear control systems, and hybrid impulsive sliding mode control systems with application to flight and space control. He is also developing theoretical and numerical algorithms to assess robustness of finite time systems.

Dr. Aldukali also serves as a Journal Reviewer for the International Journal of Robust and Nonlinear Control and the Journal of the Franklin Institute, as well as a Conference Reviewer for the IEEE Transactions on Aerospace and Electronic Systems.



## **GRADUATE** HIGHLIGHTS

# Delores Baker

College of Engineering graduate student Delores Baker won first place for her entry into the UAH Graduate School's 3 Minute Thesis Competition. She received \$250 plus expense-paid travel to represent UAH at the regional competition at the 2022 Conference of Southern Schools meeting in Raleigh, N.C., with "A Low-Cost Energy Detection-Based Spectrum Sensing Algorithm for Cognitive Radio."

Baker also won the People's Choice Award for her 3 Minute Thesis entry. She is a current Ph.D. student in Electrical Engineering.

www.uah.edu/graduate/news/16719-students-win-awardsin-uah-graduate-school-s-3-minute-thesis-competition



**ILIANA MARTIN CHITTUR** OUTSTANDING GRADUATE STUDENT AWARD

William (Owen) Sanders MSE Computer Engineering, Fall 2021



# **CONGRATULATIONS** FOR A JOB WELL DONE!

UAH's Department of Electrical and Computer Engineering offers a full range of accredited degree programs through the Ph.D. level, in addition to separate interdisciplinary master's degrees in software engineering and cybersecurity. Our programs are designed to not simply train students to be users of current technology, but also to educate them so that they actually understand how this technology works. As a result, our graduates can be found throughout the world, actively impacting the industry, governments, and academia.

For more information about our department or to learn more about our degree programs, please visit www.uah.edu/eng/departments/ece

### **DEGREES** OFFERED:

Bachelor of Science in Computer Engineering (BSCPE)

Bachelor of Science in Electrical Engineering (BSEE)

Bachelor of Science in Cybersecurity Engineering (BSCBSY)

Master of Science in Computer Engineering (MSCPE)

Master of Science in Cybersecurity Engineering (MSCBSE) (jointly with Computer Science & the College of Business)

Master of Science in Software Engineering (MSSE) (jointly with Computer Science)

Master of Science in Electrical Engineering (MSEE)

Doctor of Philosophy in Computer Engineering (jointly with UAB)

Doctor of Philosophy in Electrical Engineering



COLLEGE OF ENGINEERING

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Mitch Duke Army Corps of Engineers

Michael Hale Trideum Corporation

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Terry D. Rolin NASA MSFC

Brian Smith, Chair ARMDEC

Mike Watson NASA MSFC

#### **UAH MEMBERS:**

Mr. Ron Bowman

Dr. Rhonda Gaede

Dr. David Pan



#### COLLEGE OF ENGINEERING

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