DEPARTMENT OF

ELECTRICAL & COMPUTER ENGINEERING

MISSISSIPPI STATE UNIVERSITY™

ECE DEPARTMENT HEAD LETTER

It continues to be my greatest honor to serve you all as the head of the Department of Electrical and Computer Engineering (ECE). The year 2021 was an outstanding year for the department. Drs. Jean Mohammadi-Aragh, Ali Gurbuz, and Bo Tang each received the National Science Foundation Early CAREER Award. This is the first time in Mississippi State's history that a department has received three CAREER awards in a single year. We have also had other notable achievements with our doctoral enrollment hitting 100 students, which is a record number. In addition, Dr. Robert Moorhead received an $86 million grant as principal investigator, another record achievement.

We have also celebrated some new department initiatives. The department held its first research symposium in Fall 2021, and the best teaching assistant award was constituted for the department. Through a generous gift from one of our early computer engineering graduates Charles "Charlie" Hudnall, we were able to establish the Charles Hudnall ECE Makerspace, which also is the only on-campus departmental makerspace at Mississippi State University.

I am honored to report to you our first class of "ECE Wall of Fame" inductees, namely: James W. Bagley (CEO-Lam Research); H. Ed. Blakeslee (Vice President-Mississippi Power); Drayton D. Boozer (Technical Manager-Sandia National Laboratories); Jack Bradley (General Manager-Savannah Electric Generation); John B. Noblin (Chief Engineer-Lockheed Martin); and Charles C. Wade (Owner-C&W Construction Company). The Wall of Fame is located on the first floor of Simrall Hall near the auditorium.

I am also honored to report to you our first class of "ECE Distinguished Alumni" awardees, namely: David S. Akers (President-SmartSAT); William "Billy" Ball (Executive Vice President-Southern Company); and Bruce Deer (CEO-Trilogy). The distinguished alumni are honored to have their names on the outside wall of the ECE Freshman Design Classroom on Simrall's ground floor.

As part of the installations of the ECE Wall of Fame inductees and the ECE Distinguished Alumni awardees, these individuals were acknowledged in the presence of their family members in a ceremony on October 29, 2021. Furthermore, I am pleased to report that the names of the retired and emeritus ECE professors are now displayed on the ground floor next to the elevators. I hope that you will visit Simrall Hall to recall your time on campus by remembering the outstanding professors who have called ECE their home.

I am of the firm opinion that our ECE Department can only succeed if our alumni and students are successful. Please drop me a line, call me, text me, or email me – I would like to know how we can serve you better as we continue to grow and succeed.

Hail State!

Samee U. Khan, Ph.D.

ECE Department Head, Professor, and James Worth Bagley Chair

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ECE BY THE NUMBERS

$11.94 MILLION
in Research Expenditures

OVER 700
Undergraduate and Graduate Students

27 FACULTY
Members including
6 ENDOWED PROFESSORS

106
UNDERGRADUATE DEGREES AWARDED

38 CO-OP STUDENTS

Approximately
100 PH.D. STUDENTS

82@4.0
Fall ECE Students

**2021 DATA*

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ECE AT MISSISSIPPI STATE UNIVERSITY

WWW.ECE.MSSTATE.EDU

VISIT US

406 Hardy Road, 216 Simrall Hall
Mississippi State, MS 39762

DEPARTMENTAL SCHOLARSHIPS 2021-22

ED AND MARILYN BLAKESLEE MISSISSIPPI POWER ENDOWED SCHOLARSHIP
- John Arnoult
- Brady Bennett
- Nicholas Collins
- Ryli Cruz
- Conner Davis
- Andrew Donald
- John Frye
- Nathan Gardner
- Ryan Harper
- Sarah Johnson
- Jacob Lee
- Brennan Sheckart
- Jonathan Windham

JIM AND BRENDA HARDEN FAMILY ENDOWED SCHOLARSHIP
- Aryonna Johnson

HUEY AND LULU NGO LEGACY ENDOWED SCHOLARSHIP
- Benjamin Murphy

L. L. PATTERSON MEMORIAL SCHOLARSHIP
- James Baker
- Joseph Miller
- Roselynn Nelson

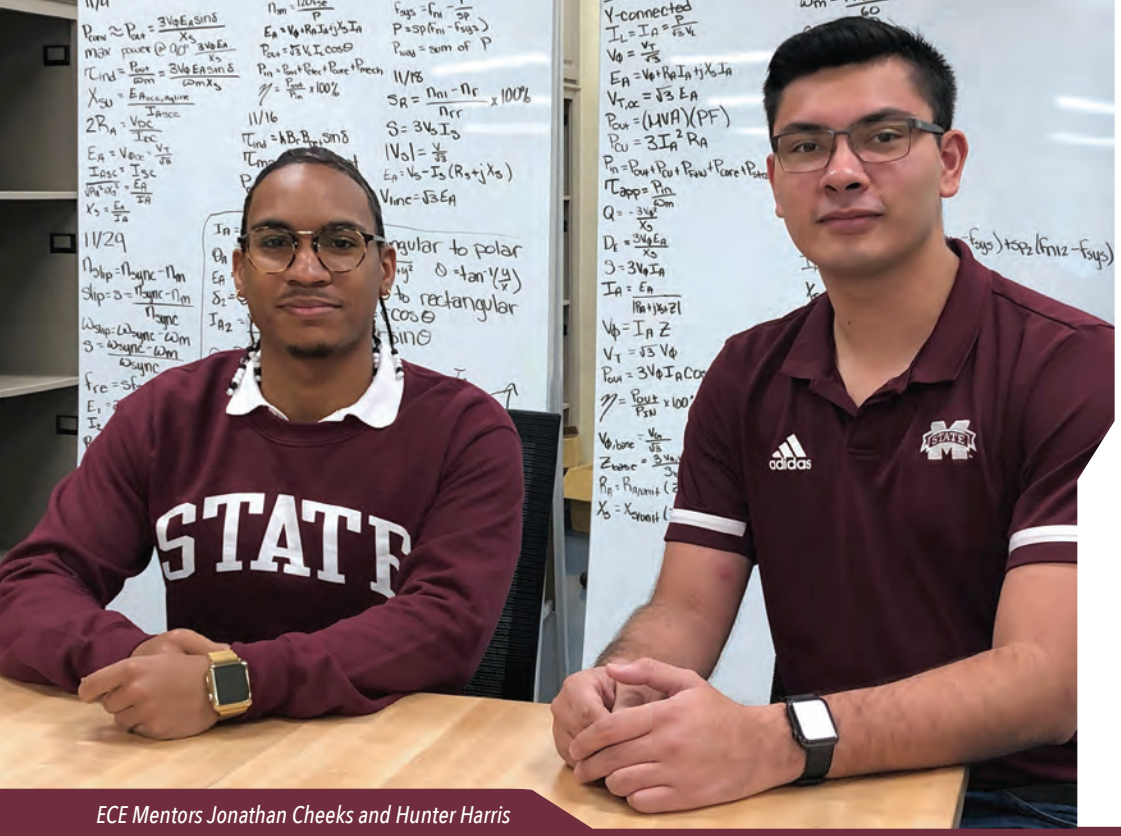
E. GRADY PERKINS SCHOLARSHIP FUND
- John Gathings
- Bryce Harrison
- Abigail Mitchell

ROBERTO PUON ENDOWED MEMORIAL SCHOLARSHIP
- Ajaya Dahal

ANDERSON T. SNIDER MEMORIAL SCHOLARSHIP
- Daegan Appel
- Augustine Espino
- Deven Lee
- Nathaniel Possel
- Adesola Raji

ANTHONY AND TONYA WILSON ENDOWED SCHOLARSHIP
- Dylan Gutierrez
- Alexander Rogers
- Jonathan Windham

ELECTRIC POWER COMPANIES IN MISSISSIPPI SCHOLARSHIP
- Noah Christensen
- Tyler Cresap



ECE Mentors Jonathan Cheeks and Hunter Harris

"I know that I would not be where I am in my academic career today without the upperclassmen who told me about electrical engineering and confirmed my desire to be in the major. Having a mentor gives students a goal. It also gives them comfort that electrical engineering is an attainable major since they can see someone who has been in their shoes succeeding."
~ Jonathan Cheeks

STUDENT SPOTLIGHT
UNDERGRADUATE MENTORS JONATHAN CHEEKS AND HUNTER HARRIS

Jonathan Cheeks and **Hunter Harris** are two of the Department of Electrical and Computer Engineering upperclassmen who are making a difference by serving as peer mentors to ECE students.

Under the supervision of ECE Assistant Professor Jean Mohammadi-Aragh, peer mentors serve an integral role in Introduction to ECE Design I, a course most ECE students take their first semester on campus or in the program. Both Cheeks and Harris noted that having peer mentors of their own prompted their desire to assist students in the department and at the university.

"I know that I would not be where I am in my academic career today without the upperclassmen who told me about electrical engineering and confirmed my desire to be in the major," Cheeks, an electrical engineering senior, said. "Having a mentor gives students a goal. It also gives them comfort that electrical engineering is an attainable major since they can see someone who has been in their shoes succeeding."

Harris, a computer engineering senior, said he had the same desire to give students confidence and serve as a resource. He also noted that mentoring opened his eyes to the importance of engineering education and how the field requires being open-minded to different techniques and solutions.

"I knew I wanted to give back to these first-year ECE students in some way or fashion. One of the primary reasons I wanted to be a mentor was to give back to my department and community," he said. "I have worked in teams before, so I knew I could help foster that with each student, and I have the will to help students when they are struggling. I can use this mentor experience to help me pursue a field revolving around engineering education."

In addition to helping students with skills in design labs, mentors also serve as a valuable resource in helping students learn about the department, providing insight on opportunities, and answering students' questions about activities, the university, or the field.

"Since peer mentors have recently completed courses or similar activities, peer mentors provide a valuable, current perspective about the department," Mohammadi-Aragh said. "Peer mentors can help students understand what a co-op experience is all about or how to connect with a faculty member to participate in undergraduate research."

While the mentees are gaining insight and assistance, the mentors similarly benefit from helping others and find the work fulfilling. Mohammadi-Aragh said the mentors gain valuable experience, a leadership role for their resume, and a small scholarship for their assistance. However, the personal value is also important to the mentors.

"Being able to see the students' faces light up when a project was completed and functional had to be the most rewarding aspect," Cheeks said. "Electrical engineering labs can seem impossible sometimes, but being able to give the guidance for success always warms my heart."

"The most rewarding part is watching my students grow from the beginning of the semester to the end," Harris said. "Showing my students how supportive I can be inside and outside the lab setting means a lot to me."

In addition to serving as a mentor, Cheeks is the president of the Society of African American Studies and a member of I.M.A.G.E. (Increasing Minority Access to Graduate Education). He has also been the previous president of the National Society of Black Engineers and is still a current member.

Harris has also been active on campus as the head drum major of the Famous Maroon Band, an information assistant, a member of both the Student Veteran Association and the Indigenous Students and Allies Association. He has served as treasurer in Alpha Tau Omega and been a member of Kappa Kappa Psi, serving on the southeast district council. ●

ECE GRADUATE PROGRAM
UPDATES FROM DR. QIAN (JENNY) DU

In Fall 2021, the ECE Department launched its inaugural research symposium. Twenty students presented their research work on October 15. The Best Presentation Award was presented to graduate student Amine Taoudi for his presentation titled "Design and optimization of a hybrid electric vehicle with energy efficient longitudinal control and bio-inspired trajectory planning and tracking." He is advised by Drs. Chaomin Luo and Randy Follett.

In Summer and Fall 2021, ten graduate students completed their degree work for the department. These Mississippi State University graduates are Samantha Butler, Jackson Cornelius, Preston Darling, Roshan Dhakal, Austin Flynt, Moinul Haque, JR Jamora, Elakiya Jayaraman, Himangi Srivastava, and Kamran Yousefpour. Congratulations to these recent graduates!

In addition to celebrating our graduates and beginning a research symposium, the department also awarded its 2021 Best ECE Teaching Assistant Award, which was presented to Keith Powell for his work with the lab for Embedded Systems.

Dr. Qian (Jenny) Du, ECE Graduate Program Coordinator and Professor

"The most rewarding aspect of being a TA is getting to see and take part in the students' growth over a semester or even several years," Powell said. "Having the opportunity to contribute to the next generation of successful engineers is a wonderful experience."

The ECE Teaching Assistant Award is an annual recognition within the department that includes a $500 monetary award. It is designed to acknowledge the hard work and dedication of a graduate student who is assisting students.

ECE's graduate programs are continuing to grow, with the department's programs including the Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) degrees in Electrical and Computer Engineering. Both are offered on-campus as well as through distance education. These programs prepare graduates for leadership roles in the constantly changing activities of research, development, product design, consulting, and education. More information may be found at ***www.ece.msstate.edu/graduate.*** ●

AUGUST AND DECEMBER 2021 ECE GRADUATE THESES AND DISSERTATIONS

Ph.D. Dissertation by Moinul Shahidul Haque
Major Professor: Dr. Seungdeog Choi
Degradation Modeling and Degradation-Aware Control of Power Electronic Systems

Ph.D. Dissertation by Himangi Srivastava
Major Professor: Dr. Mehmet Kurum
Methods for Inference and Analysis of Gene Networks from RNA Sequencing Data

Ph.D. Dissertation by Kamran Yousefpour
Major Professor: Dr. Chanyeop Park
Novel Considerations for Lightning Strike Damage Mitigation of Carbon Fiber Reinforced Polymer Matrix (CFRP) Composite Laminates

MS Thesis by Samantha Butler
Major Professor: Dr. Ali C. Gurbuz
Evaluation of Hyperspectral Band Selection Techniques for Real-Time Applications

MS Thesis by Jackson Cornelius
Major Professor: Dr. John Ball
Estimating and Leveraging Uncertainties in Deep Learning for Remaining Useful Life Prediction in Mechanical Systems

MS Thesis by Preston Darling
Major Professor: Dr. John Ball
Exploring the Use of Neural Network-Based Band Selection on Hyperspectral Imagery to Identify Informative Wavelengths for Improving Classifier Task Performance

MS Thesis by Austin Flynt
Major Professor: Dr. Mehmet Kurum
Unmanned Ground Vehicle System to Collect Soil Moisture Data

MS Thesis by Jan Rainer Jamora
Major Professor: Dr. Ali C. Gurbuz
Angular-Dependent Three-Dimensional Imaging Techniques in Multi-Pass Synthetic Aperture Radar

MS Thesis by Elakiya Jayaraman
Major Professor: Dr. Chaomin Luo
Annealing Enabled Immune System Algorithm for Multi-Waypoint Navigation

AWARDS & RECOGNITION

NSF AWARD FOR SMART SENSING SYSTEMS

Ali Gurbuz, an assistant professor in MSU's Department of Electrical and Computer Engineering, is being recognized for his early career success and impactful research with a prestigious National Science Foundation (NSF) CAREER Award.

Gurbuz is receiving $500,000 to support his research developing sophisticated smart sensing systems, which have the potential to improve the data collected and processed by everything from autonomous vehicles to precision agriculture to medical imaging machines. Gurbuz is co-director of the Information Processing and Sensing (IMPRESS) laboratory, which conducts basic and applied research in sensing systems and information processing.

"The amount of data each sensing system is capable of collecting is increasing very fast, but our ability to process and store this amount of data is not really keeping up," Gurbuz said. "That's why we need to develop some smart sensing systems that use machine learning to know what measurements to take depending on what the data is being used for. Whether we're using camera, radar or lidar systems, we're trying to get the information out of all of those sensors as efficiently as possible."

Gurbuz joined the MSU faculty in 2018 following an appointment at the University of Alabama. He earned a master's and doctoral degree in electrical and computer engineering from Georgia Institute of Technology, as well as a bachelor's degree from Bilkent University in Turkey. Since joining MSU, he has collaborated with research centers such as the Center for Advanced Vehicular Systems and the Geosystems Research Institute.

"The collaboration and the facilities in our department and university are really at a high level," Gurbuz said. "I'm also lucky because one of the focus areas in our department is signal processing, machine learning and sensing, so there

are several faculty in this area that I can collaborate with."

Gurbuz said he sees the potential to revolutionize many different industries by using advanced sensing systems. The work will also likely lead to new hardware technologies to facilitate the advanced systems.

"When you consider a camera, a medical sensor or a radar, all of those systems take some type of data and generate information such as an image," Gurbuz said. "The data that is acquired is done so without really thinking what that data will be used for. Whether you're looking into a detection, reconstruction or classification problem or something else, they take the data the same way. In several areas, we are processing all of those data on the back end in a computer or a server or in the cloud, without really putting any intelligence on the front sensing systems. Our goal is to really put intelligence on the front end with the sensing systems." ●

AWARD FOR MODEL OF DEVELOPMENT FOR UNDERGRADUATES

Jean Mohammadi-Aragh, an assistant professor in the Department of Electrical and Computer engineering, has earned the prestigious Faculty Early Career Development (CAREER) award from the NSF.

Mohammadi-Aragh is receiving nearly $1 million to develop better ways of teaching programming and other computing skills to undergraduate students across the country. The project, titled "CAREER: Creating a Model of Programming Skill Development to Improve Undergraduate Computing Education," aims to reduce barriers to entering the computing workforce.

"Learning to program can be very difficult," said Mohammadi-Aragh. "People are comfortable communicating with other people. We have been practicing creating sentences and expressing ideas for years. But communicating with a computer requires a different skillset. It's both a different way of thinking and a new vocabulary. And if you can master that, if you can learn to program, you open the door to some excellent career opportunities."

Estimates show that there are more than 500,000 unfilled computing jobs in the United States. Additionally, occupations that require computing, including engineering, comprise more than 50 percent of all projected new jobs in STEM fields. But a lack of programming knowledge has served as an impediment to filling those positions. Mohammadi-Aragh's research has the potential to lower that barrier by transforming the way computing skills are taught.

The research goal for the project is to create a model of undergraduate programming skill development that is based on direct learning measures and the best practices of industry experts. The educational goal is to create a community for future computing educators so that they can more easily apply the research findings in their own classrooms.

The project will broadly examine how people learn to program and specifically investigate how writing instruction can support students in programming classes. If successful, the project has the potential to increase the number of students who complete computing degrees and, as a result, transition into the computing workforce.

"Computing is everywhere these days, which means that the project supports computer engineers and computer scientists, but it also supports students in other majors that take programming courses, including other engineering majors, information technology, and more," said Mohammadi-Aragh.

A two-time MSU alumna, Mohammadi-Aragh earned a bachelor's degree in computer engineering from Mississippi State in 2002. She completed a master's degree in the same field in 2004 before earning her Ph.D. in engineering education from Virginia Tech in 2013.

"I am full of gratitude for everyone who has helped me get to this point in my career," said Mohammadi-Aragh. "As an MSU Bulldog, through and through, this achievement is a reflection of Mississippi State's excellence. I have benefitted from countless enriching experiences with so many outstanding people, all across campus." ●

AWARD TO STUDY AI LEARNING CAPABILITIES

Bo Tang, an ECE assistant professor, has earned the NSF's prestigious Faculty Early Career Development (CAREER) award to study the lifelong learning capabilities of artificial intelligence systems.

The $500,000 grant is for the research project titled "Career: Towards Biologically Inspired Lifelong Learning with Multimodal Association," which has the goal to develop an artificial intelligence that better accumulates knowledge and learns multimodality association.

"I am deeply honored to receive this prestigious award to support our artificial intelligence research," Tang said. "The success of this research will advance fundamental knowledge in artificial intelligence and will have the potential to transform how the field creates human-like artificial intelligence with lifelong learning capability."

The ability to learn continuously is crucial if artificial intelligence systems are to achieve high levels of performance, flexibility and adaptation. This is especially important when AI systems are interacting with the real world and processing streaming sensory data. Tang's research will investigate biologically inspired lifelong learning methods that incorporate characteristics of the mammalian brain, arguably the best learning system the world has seen.

"The architectures and methods we will be developing will be under the umbrella of a new lifelong learning framework," Tang said. "This will enable effective and efficient interactions between learning and memory in deep neural networks."

Tang received his bachelor's degree from Central South University in 2007 and a master's degree from the Institute of Electronics, Chinese Academy of Sciences in 2010. He earned his Ph.D. in electrical engineering from the University of Rhode Island in 2016. Before joining the Bagley College of Engineering faculty, he worked as an assistant professor in the Department of Computer Science at Hofstra University. ●

ECE ALUMNUS CREATES MAKERSPACE

Charles Hudnall, a 1986 Mississippi State University computer engineering graduate, recently made an impact on the university and the department that assisted with his career path.

The Department of Electrical and Computer Engineering (ECE) opened the Charles Hudnall Makerspace in Simrall in fall of 2021. Hudnall's lifetime of tinkering prompted his interest in providing a dedicated space for students to experiment, create, and participate in hands-on opportunities, especially for students who need a place to connect regularly to the department.

Although he began as a civil engineering major at Mississippi State, Hudnall changed to computer engineering at the same time the personal computer industry was starting to thrive.

"I changed all of my classes from the civil engineering major to focus on computer engineering," Hudnall said, noting the decision to major in computer engineering was driven by his love of electronics, his personal computer, and tinkering.

This hands-on experience shaped his understanding of the importance of a makerspace that allows for students to complete their projects, whether for an ECE class or for another department, and foster creativity and teamwork.

"The makerspace has tools that can be used on almost any kind of engineering- or physics-related project. Students can use the tools to work on school projects or just experiment with new skills or techniques," Hudnall said. "It can also be a place to meet other like-minded students that have skills you can learn from or team up with on your next project. I truly believe that the makerspace can be a productive and fun space to help students learn by doing."

Hudnall, whose father was a Mississippi State civil engineering graduate, noted that engineering is always evolving and that problem-solving is important. He also said operating with integrity, being curious, and working hard are important in the field.

"Engineering is an awesome career, but it is not just one thing. It constantly evolves. I am always trying to learn something new, as learning is a lifelong endeavor and not something you do as a college student and then stop," he said. "I found in my career that solving problems has not simply involved electrical and computer engineering skills, but requires multiple disciplines to solve the particularly difficult problems."

His interests and his skills have propelled him to have a broad range of successful experiences in the industry for over 35 years, and Mississippi State helped start his path.

"The experience of going through the undergraduate ECE program shaped me and gave me a base of knowledge to build a career on," Hudnall said. "I am forever grateful to MSU for this educational foundation, and our family wanted to demonstrate our gratitude through the makerspace lab."

"Engineering is an awesome career, but it is not just one thing. It constantly evolves. I am always trying to learn something new, as learning is a lifelong endeavor and not something you do as a college student and then stop. I found in my career that solving problems has not simply involved electrical and computer engineering skills, but requires multiple disciplines to solve the particularly difficult problems." ~ Charles Hudnall

ECE Department Head Dr. Samee Khan (left) and ECE alumnus Charles Hudnall (right) at the dedication of the Charles Hudnall Makerspace in the fall.

Hudnall recently retired as Vice President/Chief Technologist, Microelectronics of Mercury Systems, and he currently serves on the MSU's ECE Advisory Board, which helps create a long-term impact on the department.

"Real success to me is simply the inner peace of knowing that I did the best that I am capable of. I wish that kind of success for all the current and future ECE students at MSU," he said. "Make today your masterpiece!" ●

Alumnus and ECE Advisory Board Member Charles Hudnall welding in the new makerspace, which was made possible with his donation.

MISSISSIPPI STATE UNIVERSITY™
JAMES WORTH BAGLEY COLLEGE OF ENGINEERING
Department of Electrical and Computer Engineering

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MAKE AN IMPACT

Through the generosity of alumni and donors, the Department of Electrical and Computer Engineering (ECE) continues to grow its legacy within the James W. Bagley College of Engineering. Individuals wishing to invest have many opportunities, including scholarships, endowments, named awards, and facility enhancements. Please visit ***www.ece.msstate.edu/giving/*** or contact us directly to discuss the impact that you can make on the department and its students:

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