



2024 NEWSLETTER



AUBURN UNIVERSITY
Biosystems Engineering

FROM THE DEPARTMENT HEAD



Dr. Oladiran Fasina, P. Eng
Professor and Head
Biosystems Engineering Department

WAR EAGLE! I welcome you to read this 8th edition of the Auburn's Biosystems Engineering Newsletter. As we have done in the past, this 2024 edition of the newsletter also gives you a snapshot of the outstanding and significant contributions of the departmental faculty, staff, and students to the land-grant mission. Equally important is that through this newsletter, you can know more about the amazing members of the Biosystems Engineering family. The family continues to grow—see pages 4 and 5—and I hope that you'll join me in welcoming our new faculty and staff to the department. You will also read about some of the numerous awards received by faculty, staff, and students in the department.

Our students often participate in high impact experiences (research, study abroad, internships etc.) – some of which are featured in this newsletter. I especially want to draw your attention to page 34 of the newsletter, detailing the placement of two Biosystems Engineering Senior Design teams (1st and 2nd place) at the inaugural Samuel Ginn College of Engineering Capstone Design Showcase.

There are several stories in the newsletter with QR codes that provide more in-depth information. Throughout the year, you can always read more about the department on our website (www.eng.auburn.edu/bsen) and by following us on social media, using the QR code on the back. Thank you so much for your support of the department.



2024 BSEN FACULTY

AWARDS

STUDENTS

Inaugural Matthews
Scholars Program Fellow
Jada Neal

1st Place Southeast Society of
Environmental Toxicology and Chemistry
(SETAC) Poster Presentation
Alison Boardwine

Outstanding BSEN Student
Ayden Kemp

Outstanding BATM Student
Louie Harris



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FACULTY

College of Agriculture
Dean's Research Award
Dr. Sushil Adhikari

Outstanding BSEN Faculty Award
Dr. Hossein Jahromi

Outstanding Publications Award
Dr. Tanzeel Rehman
Dr. Debolina Chakraborty

STAFF

Auburn University
Employee of the Year
Caroline Whiting

Outstanding BSEN Staff Award
Bobby Bradford

Outstanding College A&P Employee Award
James Johnson

ALUMNI

National Science Foundation Graduate
Research Fellowship Program
Dylan Bowen

Outstanding BSEN Alumni Award
John Deal



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CLICK FOR
MORE AWARDS

CORLEY

ROOF REPLACEMENT

In the summer of 2024, the Tom Corley building underwent significant exterior renovations, addressing issues identified in a prior roof inspection. Below is a bird's eye-view of the newly installed roof that replaced the original slate roof and copper gutters which contributed to Corley building water leaks and moisture damage. The awning in the Corley courtyard was also replaced as part of the renovation project.



A GROWING DEPARTMENT



CHAKRABORTY

In February 2024, Dr. Debolina Chakraborty joined our department as an Assistant Research Professor. Dr. Chakraborty earned her Ph.D. in Soil Science at the University of Florida, Gainesville, in 2011. Following her doctoral studies, she worked as a post-doctoral fellow in the Agronomy Department at UF before joining Auburn University.

In her new role, Dr. Chakraborty is dedicated to advancing research and mentoring both graduate and undergraduate students. Her primary research focus is on improving the sustainability of agroecosystems. Her work centers on addressing nonpoint-source pollution, studying the fate and transport of legacy phosphorus in agricultural systems, and exploring strategies for mitigating greenhouse gas emissions.



ERRAMUSPE

Dr. Iris Erramuspe joined the department as an Assistant Research Professor in August 2024. Dr. Erramuspe completed her Ph.D. in Fiber and Cellulose Technology at Åbo Akademi University in Turku, Finland.

As an Assistant Research Professor, Dr. Erramuspe is focused on mentoring both undergraduate and graduate students while developing a research program aimed at creating cost-efficient, in-situ, and portable sensors for real-time measurements. These sensors have applications in environmental monitoring, healthcare, and agriculture. Her research centers on advancing biosensor technologies using bio-based polymers and sophisticated analytical techniques, including portable FTIR, Raman, UV-Vis, XPS, and fluorescence spectroscopy.



KHODAEI

In January 2024, Dr. Hassan Khodaei Jalalabadi joined the department as an Assistant Research Professor. Dr. Khodaei earned his Ph.D. in Mechanical Engineering from Edith Cowan University in Australia. Before joining Auburn University, Dr. Khodaei was the lead engineer for a company that designs systems to convert waste to biomass and biofuels. He was also an adjunct research scientist with the University of Alberta, Edmonton, Canada.

In his current role, Dr. Khodaei supervises Ph.D. students, writes grant proposals, and teaches undergraduates. His research focuses on biomass thermal conversion, combustion, computational fluid dynamics (CFD), and biofuel production.



SRODA

Lauren Sroda joined the department in March 2024 as a Research Engineer for the National Poultry Technology Center (NPTC). Lauren earned her degree in Biological Systems Engineering – Food and Bioprocess, with honors in research, from the University of Wisconsin-Madison in 2023. During her time there, she also served as event staff for the Chancellor and as a student ambassador before relocating to Auburn.

At NPTC, Lauren’s work focuses on enhancing the profitability of the live production sector within the U.S. poultry industry. Her role involves conducting applied research and providing educational support aimed at improving efficiencies in housing, equipment, energy use, and environmental control. While Lauren’s research interests are still evolving, she has already contributed to projects involving the implementation and evaluation of sensors for oviposition data collection.



VIRK, G

Dr. Gurpreet Virk joined the department during the summer of 2024. Dr. G. Virk completed her Bachelor of Technology in Agricultural Engineering, followed by her master’s and Ph.D. in Crop and Soil Sciences at the University of Georgia.

Prior to relocating to Auburn, she served as a Research Scientist at the University of Georgia. Dr. Gurpreet Virk is currently a Lecturer in the department and teaches courses in the Biological & Agricultural Technology Management (BATM) major. Her research interests include agronomy, seed technology, and agricultural technology.



VIRK, S

Dr. Simerjeet Virk, a familiar face in the Biosystems Engineering Department, returned in the summer of 2024 as an Associate Professor and Extension Specialist in Precision Agriculture and Machine Systems. He earned his Bachelor’s in Agricultural Engineering from Punjab Agricultural University, followed by a Master’s in Biosystems Engineering at Auburn University and a Ph.D. in Agricultural and Biological Engineering from the University of Georgia.

Before rejoining Auburn, Dr. Virk served as an Assistant Professor and Extension Specialist at the University of Georgia. Now, his work primarily involves extension and research focused on evaluating and implementing agricultural technologies in machinery systems. He specializes in advancing precision agriculture by disseminating knowledge through training sessions, field days, workshops, and publications, helping growers adopt innovative agricultural technologies.

FACULTY SPOTLIGHT

DR. JASMEET LAMBA
ASSOCIATE PROFESSOR



TELL US ABOUT YOURSELF

I was born in Punjab, a state in northwestern India. I completed my undergraduate degree in Agricultural Engineering at Punjab Agricultural University, India. Immediately after completing my undergraduate degree, I joined Auburn University to earn a Master's in Civil Engineering. I completed my PhD degree in Biological Systems Engineering from the University of Wisconsin-Madison. Before joining as a faculty member in the Biosystems Engineering Department at Auburn University, I was a postdoctoral scholar at Penn State University, State College, Pennsylvania. When not working, I like to spend time with my family and travel.

WHY AUBURN UNIVERSITY?

Auburn University is an excellent school with great resources for teaching and research. The colleagues in the department are very supportive. Auburn is a great town with plenty of things to do in and around the area. The local public schools are also highly rated, making it an excellent place for families.

TELL US ABOUT YOUR INDUSTRY EXPERIENCE

I have been working in the area of hydrology and water quality for more than 15 years. Working in various areas of the US has helped me better understand agricultural challenges in different regions. Over the past 15 years, I have worked on diverse projects focused on sediment fingerprinting, precision irrigation, watershed modeling, and the impact of climate change and variability on water resources. I have been fortunate to work with talented collaborators and students who have contributed to the success of various projects.

TELL US ABOUT BIOSYSTEMS

Biosystems engineering is an exciting and challenging multidisciplinary area that trains students in various fields. One of the fields is Ecological Engineering, which is the focus of my research. The Biosystems courses provide students with hands-on experience as a part of the curriculum, helping them to pursue successful careers in various fields.

BEST PART OF THE JOB?

The opportunity to teach and mentor students from various backgrounds and help them grow academically and personally is one of the best parts of the job. Looking back at the students pursuing successful careers in industry or academia is very rewarding. Additionally, in this job, there is the freedom to pursue research in the area of my interest, and there is always something new to learn.

ANY ADVICE?

One of the best pieces of advice I have ever received is to focus on the present moment instead of ruminating on the past or worrying about the future.



GIVING PRIORITIES



- **“Named” Endowed Professorships - \$300,000**
 - » Named professorships to recruit and retain outstanding faculty.
- **“Named” Doctoral Graduate Fellowship - \$35,000+ per year**
 - » Doctoral graduate fellows to recruit and train the next generation of Biosystems Engineering scholars.
- **“Named” Masters Graduate Fellowship - \$25,000+ per year**
 - » Masters graduate fellowships to recruit and retain graduate students who want to make immediate contributions to the profession.
- **“Named” Undergraduate Scholarships - \$25,000+**
 - » Endowed scholarships to recruit and retain outstanding undergraduate students.
- **“Named” spaces in Corley Hall - \$25,000+**
 - » Funds for attic and classroom renovations.
- **Fund for Excellence - \$50,000+**
 - » Dedicated support for various research needs.
- **Corley Renovation/Expansion Naming Opportunity - \$6,000,000**
 - » Create space in Corley for the rapidly growing Department of Biosystems Engineering.

[CLICK TO
VIEW MORE](#)



E-DAY

Auburn University's Samuel Ginn College of Engineering hosts an annual open house (E-DAY) for middle school and high school students to explore careers in engineering as well as Auburn's campus.

During the open house, students and their families visit various engineering programs including one-on-one interactions with current engineering students and faculty. Attendees also have the opportunity to engage with interactive exhibits, labs, and gain insights into admission processes, scholarships, and other opportunities for students in the college and throughout the University.

In 2024, the Department of Biosystems Engineering showcased a diverse array of exhibits, including the bioretention cell, biofuel cells, student design lab, precision agriculture, aquaponics, and crayfish lab.

Featuring our comprehensive program with 15 tours led by 42 enthusiastic guides, we welcomed approximately 380 students, teachers, and parents. The event successfully highlighted the Department of Biosystems Engineering's rich offerings, providing a dynamic and informative experience for all participants.

Here's what guests had to say about our department: "The most interesting E-Day experience was definitely the Biosystems Engineering tour, they had so many interesting things to learn about and see, they were also the most entertaining tour guides."

"My favorite part was the biosystems tour. The people were awesome, and the material we learned was stellar."



BIOSYSTEMS IS CAMERA READY

Throughout its 105-year history, the Biosystems Engineering department has been in the spotlight of advancing new technologies for agricultural and forestry systems. These three documentary-style videos on Precision Agriculture, URISE, and G.R.A.C.E showcase examples of the contributions of the department of the three land grant mission of research, instruction and extension/outreach.

Precision Agriculture: Part 2-The Use of Drones in Production Agriculture focuses on how the Biosystems Engineering and Crop, Soil & Environment Departments are integrating drone technologies into Precision Agriculture.



THIS IS OUR WORK
SEMINAR

PRECISION AGRICULTURE: PART 2
THE USE OF DRONES
IN PRODUCTION AGRICULTURE

CLICK TO WATCH





URISE: Undergraduate Research Improving Student Experience. This online course is designed to enhance the quality of our undergraduate research and ignite a passion for graduate studies within our department.



Dr. Brendan Higgins, associate professor and director of the NIFA-SAS funded GRACE project, and his team, introduce how GRACE is using 7 technologies to reimagine agriculture in controlled environments.





AUBURN TO ANAHEIM: ASABE 2024

The Department of Biosystems Engineering (BSEN) was hard to miss at the 2024 American Society of Agricultural and Biological Engineers (ASABE) Annual International Meeting recently held in Anaheim, California. And hard to beat. Auburn was represented at the meeting by 42 faculty members and graduate students — the largest Auburn contingent ever — and, once again, brought home multiple honors.

Associate professor Brendan Higgins received the New Holland Young Researcher Award, a major ASABE recognition honoring members under 40 for “outstanding contributions to the advancement of the profession.” Higgins also received the Outstanding Associate Editor award for his work in ASABE peer-reviewed journals, while associate professor Simer Virk was recognized as an Outstanding Manuscript Reviewer.

Student research was also in the spotlight. Kritika Maholtra, who recently earned both a master’s and Ph.D. from Auburn, along with her advisor, Associate Professor Jasmeet Lamba, received a Superior Paper Award in the Natural Resources and Environmental Systems division.

Preetika Kaur, a recent master’s graduate, placed first in the Boyd-Scott Graduate Research Award. Graduate students Raziye Jokar and Bipasyana Dhungana both received the student presentation award with Bipasyana earning her second award in the poster competition.

Graduate students Rachel Day, Noor Fatima, Vivian Usha and Raziye Jokar, under the guidance of professor Sushil Adhikari, director of the Center for Bioenergy and Bioproducts, and Assistant Professor Hossein Jahromi, took second place in the Bioprocess Startup Competition.

Master’s student Ayden Kemp, who in 2023 was named both a Goldwater Scholar and an Astronaut Scholar, didn’t need another honor to stand out. But he got it. Advised by Adhikari, Kemp, who recently earned a bachelor’s degree from Auburn in Biosystems Engineering and is on track for the same in Aerospace Engineering in 2025, clinched first place in the K.K. Barnes Student Paper Award for undergraduate students. But he’s equally proud of the superlative bestowed upon the Auburn Chapter of the honor society for Agricultural and Biological Engineering, Alpha Epsilon, which primarily focuses on promoting professional development for members and community service. The Delta Beta chapter was named Most Outstanding in the nation.



AU EMPLOYEE OF THE YEAR

After working for a consulting firm for a year following her graduation in 2018, Whiting returned to the Plains and the department as a Research Engineer in 2019 and was recognized in May 2024 as the Auburn Employee of the Year in the Technical/Paraprofessional category. Over the past five years, Whiting's role as a Research Engineer has evolved. She started with providing technical support for the department's gasifiers, assisted with engineering designs for department personnel, led the UAV program, managed recruitment, and established a positive safety culture in the department. Now, she is taking up an additional role as a Project Manager for the Auburn University Rural Partnership Institute and GRACE (Green Re-imagining of Agriculture in Controlled Environments).

One of her favorite work memories has been seeing the excitement of potential students at E-Day, Auburn Engineering's annual open house, where she organized tours of the biosystems engineering building for prospective students and coordinated BSEN student volunteers. As both an alumna and current employee, Whiting said she has "a lot of great things to say" about the department. "I always loved Auburn when I was here, but I didn't really know what to expect working here, and it wasn't really what I expected—in a good way.

It sounds really cheesy, but sometimes you just know it's the right path," Whiting said. "I'm very blessed because some people have jobs and it's just a job. But for me it's the culture of the department and the university that makes it more. People, too. Having a great team makes it the full Auburn experience."

Department chair and Whiting's nominator Oladiran Fasina has known Whiting and her husband, Josh, since they were both biosystems engineering students and has now witnessed her outstanding contributions to the department as an employee. "Caroline is significantly involved in the ability of our department and university to meet the three land-grant missions of research, instruction and outreach/extension," Fasina wrote in Whiting's nomination. "Her contributions to our mission have been excellent and extraordinary."

When Whiting was touring colleges back in high school, Auburn came out on top. "It had a feeling about it; it just felt like home," she recounted. And that same unnameable feeling Whiting had while visiting campus for the first time is one of the reasons why she came back and has stayed as an employee.

2023 PEER REVIEWED JOURNAL ARTICLES

A photograph of a male scientist in a light-colored lab coat, wearing a blue surgical mask and safety glasses. He is wearing blue nitrile gloves and is focused on a task in a petri dish or similar container. The background is a blurred laboratory setting with various pieces of equipment.

**BIOPROCESS
ENGINEERING**

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A photograph of a woman with long brown hair tied back, wearing a blue hoodie. She is leaning over a tomato plant in a controlled environment, possibly a greenhouse or growth chamber. The plant has several clusters of green and red tomatoes. She appears to be examining the plant closely.


**CONTROLLED
ENVIRONMENT
AGRICULTURE**

18



**ECOLOGICAL &
WATER RESOURCES**

18



**EMERGING
SYSTEMS**

8



SMART SYSTEMS

9



53% Female

Auburn University's highest
engineering female percentage



GRADUATE STUDENTS



HELEN KO

Ecological Engineering

I first discovered Biosystems Engineering while I was in the process of applying to college. At the time, I was uncertain about what I wanted to major in, so I spent a lot of time scanning the list of available programs at Auburn University—a school I was particularly eager to attend because my father is an alumnus and my brother was also a student there. When I eventually came across Biosystems Engineering, it immediately piqued my interest. Intrigued, I decided to dig deeper and research the field further, and the more I learned, the more I realized that it aligned perfectly with what I was looking for in a career.

Currently, my research focuses on studying the impact of non-axenic bacterial biofilms on the attachment of filamentous green algae in algal turf scrubbers. I have already completed the main experiments required for my research, and I am now in the process of analyzing and processing the water samples while finalizing my thesis in preparation for my defense. As for what comes next, I'm still in the exploratory phase—applying for positions, interviewing, and waiting to see where both God and life will guide me in the future.



DALE HARTMANN

Bioprocess Engineering

In Spring 2022, after graduating with a bachelor's degree in Chemistry from Arkansas State University, I reached out to Auburn University's Samuel Ginn College of Engineering to explore furthering my education. The support I received from Mrs. Krysta Weed and Dr. Janet Moore embodied the Auburn Creed. They spent hours with me on E-Day, helping me navigate my passion for tire-derived fuels. This led to an introduction to Dr. Maria Auad, who connected me with Dr. Sushil Adhikari in the Biosystems Engineering department. In Fall 2022, Dr. Adhikari welcomed me to the Bioenergy Research Group as a Ph.D. candidate, where I focus on converting waste products like plastic and tire waste into alternative fuels through thermochemical processes.

My research aims to create circular economies and reduce the carbon footprint in the transportation sector. I am currently producing jet fuel-range hydrocarbons from waste materials like HDPE milk containers and PP drinking cups. Looking ahead, I plan to continue my research as a post-doctoral researcher or move into R&D in alternative fuels.

In Fall 2023, I received an Honorable Mention at the Auburn Engineering Graduate Research Showcase for my work on upcycling linear polyurethane plastic. Additionally, I'm part of the Auburn Rugby Football Club coaching staff, where we secured a Division II conference title in 2022 and were promoted to the DIAA division in 2023.

AUSOME SCIENCE IN 60 SECONDS

[Click to Watch](#)



AYDEN KEMP

Sustainable Aviation

One of society's greatest concerns is climate change. Numerous advancements in engineering have sought to limit global warming, but there is one glaring gap in our plan to reduce emissions, specifically air travel. Why not electrify airplanes like cars?

Let's say you are flying from Atlanta to Los Angeles to support the Auburn Tigers at the Rose Bowl during their run to a college football playoff championship. That flight would require 200,000,000 kg of batteries. That's more than 4,000 times the weight of the aircraft.

However, the solution to this challenge is sustainable aviation fuels produced from waste materials or renewable sources. Ayden's research converts pine biomass and plastic waste into oils, rich in aromatic compounds, through the pyrolysis process. These oils can then be blended with other renewable fuels to manufacture products that reduce our dependence on petroleum aviation fuel forever.

[Click to Watch](#)



VIVIAN USHA

Engineered Fertilizer

Have you ever considered how nutrient pollutants from agricultural production impact our water quality? Nitrogen and phosphorus from fertilizers and manure can easily leak into bodies of water during rainfall or irrigation, leading to algae buildup that degrades water quality and results in the death of aquatic animals.

To prevent this, my research team is developing an engineered biochar called duo-biochar. Duo-biochar can store these nutrients so they aren't easily leaked while remaining accessible to plants. To achieve this, we are using a method called pyrolysis with chemically modified pine chips as raw materials. These materials undergo heat treatment under an inert atmosphere.

We hope to solve nutrient pollution by using this engineered biochar to create slow-released-fertilizer thereby reducing nutrient leaching to preserve our water habitats.

GRADUATE & POSTDOC AWARDS

ASABE Superior Paper Award

Kritika Malhotra

1st Place AUSOME Science
in 60 Seconds

Ayden Kemp

Distinguished Dissertation Award

Hemendra Kumar

Bijoychandra Takhellambam

Engineering Graduate Research Showcase
Best Poster Presentation

Olumide Falana

Environmental Science & Technology Letters Excellence in
Review Award

Dr. Rakesh Kumar

Fresh Ideas Young Professional
Poster Competition

Wellington Arthur

Master's Thesis Award

Suman Budhathoki

Olamide Durodola

Preetika Kaur

Nathanial Nwogwu

Outstanding Doctoral Student

Kritika Malhotra

Outstanding Graduate Student
Council Senators

Olumide Falana

Outstanding Master's Student

Preetika Kaur

Student Research Symposium
College Award

Ashish Bhattarai

Hamid Syed



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MORE AWARDS](#)



UNDERGRADUATE MAJORS

Biosystems Engineering

- » Bioprocess Engineering
- » Ecological Engineering
- » Forest Engineering

Biological & Agricultural Technology Management

GRADUATE PROGRAMS

Master of Science

Doctor of Philosophy





THE UNDERGRADUATE EXPERIENCE



**KATHERINE
BANDHOLZ**

I had never heard of Biosystems Engineering before browsing Auburn's website, but I'm so glad I picked this major. I couldn't ask to be surrounded by better people in this department- it's certainly a family atmosphere. My teachers care about my growth, and I have the pleasure of studying alongside friends. Biosystems courses are challenging but interesting; my favorites would probably have to be Coastal Engineering and Site Design. It was neat directly applying the knowledge and skills I learned in different courses to internships. I am confident that this department has prepared me to start a fulfilling career, and I'll look back on my time here fondly.



**AARON
FIGA**

I feel extremely lucky to have been in the BATMAN program, and it honestly changed my life at Auburn. This department cares about students more than anywhere else on campus, and you can feel it the moment you walk through the doors. It wasn't until I got to the biosystems department that I had one-on-one experiences with staff, listened to as a student, and developed relationships with classmates that will last beyond graduation. Gaining hands-on experience with industry-leading technology for the biological and agricultural production of food, fiber, and fuel is something that not everyone gets a chance to do. Through the biosystems department, students are exposed to this firsthand. The possibilities feel endless, and as a senior, I feel like I have had the opportunity to develop a unique skill set that can be used to improve the future of sustainability not just for farmers, but for all people.



**EASTON
FOREMAN**

I began my college career in Auburn University's Department of Software Engineering. While many who land in that field of engineering are successful, I wished for a career more dynamic and hands-on, or, as any Biosystems Engineering student will say, "a career that can keep me outside." Pursuit of an engineering career that could accomplish all these and more led me to Biosystems Engineering. Since making the switch, I've gained experience with valuable engineering software, instruments, and concepts taught through coursework, all of which being geared toward work in the outdoors. These have truly made me competitive for a wide variety of jobs in natural resources, energy, and environment. Beyond the scope of the classroom, the camaraderie and fellowship I've experienced with my peers is what I value most; I've gained lifelong friends and made relationships with instructors that I will cherish for the rest of my life.



**CHARLEY
GOLDEN**

Growing up in Florida, surrounded by water, I always felt committed to preserving this vital resource. Following my passion for math, science, and problem-solving, I decided to pursue engineering. When touring schools, I always said “I want to be an engineer, but don’t want to build things”. At many other universities, this elicited confused looks, but when touring Auburn Biosystems, everything just made sense. I was shown around the crawfish lab and was immediately hooked; it even inspired my college admissions essay! Through coursework and labs, I came to love field work and learned I want to play a role in the creation of new solutions. Though my end goal has changed over time, the community of students and professors in this department has kept Auburn as my home away from home and I couldn’t be prouder to be an Auburn Biosystems Alumna!



**LOUIE
HARRIS**

When I started at Auburn, I thought I wanted to follow in my brother’s footsteps and work toward becoming a veterinarian. However, when I heard about the BATM program, I was immediately interested because I have always had a passion for technology and agriculture. I soon changed my major to BATM and loved every minute of it. I have been able to be a student worker in the BSEN program, which has allowed me to collaborate with professors and research engineers. I found my place at Auburn in the Ag Ambassadors group and built lifelong friendships through my experience in the College of Agriculture. I had a fantastic college experience, and I credit that to being a member of the BATM program. My experiences with fellow students and professors made me appreciate the Auburn family. I will always be grateful to have been a part of Auburn’s College of Agriculture.



**RICE
NICHOLS**

A love for agriculture and forestry, coupled with parents who encouraged me to challenge myself, led me to pursue a degree in Forest-Biosystems Engineering. The BSEN program afforded me the opportunity to gain knowledge and experience in many different fields. From operating a skidder, to designing an incubator, to creating site designs in Civil3D, the courses I completed in the department helped me develop practical skills I look forward to using in the future. The faculty and staff were always encouraging and demonstrated the importance of hard work and professionalism in and out of the classroom. Looking back, a major aspect of the program I’m thankful for is the relationships I developed with my peers. Working on (and often struggling with) homework and assignments was made a little easier because I always had friends in the same boat. Auburn Biosystems Engineering has given me so much more than a degree.



**CAROLINE
SANDERS**

My journey into the Biosystems Engineering Department was unique. I started as a marketing major, then switched to pre-med, pre-vet, and back to pre-med before discovering biosystems through a friend and co-counselor at Camp War Eagle, Melisa Shaffer. As a junior, I jumped into engineering, participating in algae research with Dr. Blersch. I have also had the opportunity to get involved with the entire Samuel Ginn College of Engineering, where I serve as a Cupola Engineering Ambassador, giving tours to prospective students, and as the Student Initiatives Student Assistant, where I help oversee the 50+ engineering student organizations and plan events for student engagement. My advice: it’s never too late to explore new paths and seize opportunities. Now, I’m seeking a role in engineering consulting, ideally in water resources or coastal engineering, where I can apply my diverse background and passion for biosystems engineering.

#GINNING PODCAST



WELLINGTON ARTHUR

Biosystems doctoral student is set to revolutionize how wastewater is treated for lettuce production. Listen to his episode on the #GINning Podcast about lettuce and his most recent achievement at the Fresh Ideas Young Professional Poster Competition.



JADA NEAL

Bioprocessing senior is among the university's 13 inaugural Matthews Scholars Program fellows, and the only fellow representing Auburn Engineering. Listen to her episode on the #GINning Podcast to learn how Jada is harnessing the power of pectin for skincare applications.



BELLA NONALES

Bioprocessing junior talks about her path from Reeltown, AL to becoming a Biosystems Engineering student. Listen to her episode on the #GINning Podcast about being a woman in STEM, and the drum major for the Auburn University Marching Band.



MADDIE SPOOR

Biosystems junior talks about growing up in a family of engineers and navigating her path in biosystems. Listen to her episode on the #GINning Podcast about entering the greenhouse lab working in aquaponics.



HANDS-ON EXPERIENCE



ALISON BOARDWINE

A dedicated fifth-year Biosystems Engineering student has been making significant strides in the field of environmental research. Since the summer of 2023, Alison has been an undergraduate researcher under the mentorship of Dr. Tham Hoang in the Ecotoxicology and Risk Assessment Laboratory, part of the School of Fisheries, Aquaculture & Aquatic Sciences. Her work led her to co-author two notable research papers published in *Science of the Total Environment* in August 2024.

The first paper delves into the presence of heavy metals in Great Lakes sediments, focusing on concentrations, enrichment factors, and the environmental risks associated with 13 elements. Alison played a crucial role in processing 175 sample segments from multiple lakes and curating data for analysis. The second paper explores the impact of microplastics on aquatic organisms, where she conducted extensive acute toxicity tests and analyzed microplastic accumulation in *Daphnia magna*. Her contributions were pivotal in the research findings.

Alison's dedication to environmental science was further recognized when she won first place in the Undergraduate Student Poster Presentation at the 2024 Southeast Society of Environmental Toxicology and Chemistry (SETAC) conference. Her experiences have not only deepened her understanding of human impacts on the environment but also reinforced her commitment to mitigating environmental risks, particularly in the animal health industry.



ANNA GRACE KEEL

A senior in Biosystems Engineering focusing on Bioprocessing, recently completed a transformative 10-week internship through the Oak Ridge Institute for Science and Education (ORISE) with the Indian Health Service Olympic District Office in Bremerton, Washington. The office focuses on providing vital engineering services to Native American tribes and underserved communities. During her time there, Anna Grace gained hands-on experience in assessing infrastructure deficiencies, collecting GIS field data, and managing engineering construction projects. Notably, she led the development of a hydraulic model for a community water system and refined designs for drinking water improvement projects.

Her role also included contributing to the creation of specifications, conducting construction inspections, and assisting with sanitation improvement projects. The mission of the Indian Health Service, which aims to elevate the physical, mental, social, and spiritual health of American Indians and Alaska Natives, deeply inspired Anna Grace. She observed firsthand how the people she worked with were dedicated to this mission, finding fulfillment in their contributions to the community.

Reflecting on her internship, Anna Grace expressed gratitude for the support and education provided by the Department of Biosystems Engineering, which prepared her for such meaningful work. She emphasized the importance of building professional relationships and advised future students to take bold chances, as unexpected opportunities can lead to significant personal and professional growth.



ON AND IN THE FIELD

Godwin Owolabi, an all-region lineman and Auburn football walk-on, is pursuing a degree in Biological and Agricultural Technology Management (BATM) with a focus on sustainability. His passion for agricultural technology began in 4-H, where he participated in a greenhouse project at Booker T. Washington High School, cultivating various crops. Recognizing his interest, his advisor suggested BATM as the ideal path.

Owolabi draws inspiration from George Washington Carver, whose commitment to education and innovation profoundly influences him. "George Washington Carver was a visionary and we're lucky to be able to study his life," Owolabi said.

"I've been to the George Washington Carver Museum at Tuskegee University multiple times on many field trips. It's amazing, first, to see what he was working with – they still have some of the actual plants in jars that he worked on and studied – and the research tools themselves were limited and primitive. Plus, the times he was living in were very different and challenging."

Minoring in horticulture, Owolabi aspires to address future challenges in food production and water conservation. He envisions producing organic crops and improving water filtration systems, aiming to tackle global issues like climate change and food security.

"I look at articles talking about the climate and how things are changing, and I want to be a part of the future and how we're going to fix these problems. My classes and training are providing me tools to do that."

Owolabi also sees himself working with AutoCAD and sustainable practices to make a significant impact on the future of agriculture. He believes in preserving the global food supply as the population grows, and he's determined to be a part of the solution.

"We've got to preserve our food supply globally because the population gets bigger. We've got to find a way to feed people, and I want to be a part of that."

STUDY ABROAD



CARSON BEDICS

I recently completed the Environmental Science and Engineering study abroad program at Texas A&M University in Leuven, Belgium. The 40-day program involved courses in air and water quality engineering, combining traditional lectures with seminars and visits to Belgian facilities. This immersive experience provided a deep understanding of the European Union's circular economy and encouraged comparisons between US and EU practices, especially in wastewater treatment, air quality regulations, and energy generation.

Living abroad also offered organic comparisons between American and European lifestyles, highlighting differences in everyday activities such as grocery shopping, transportation, and leisure. Belgium's emphasis on public transportation and human-centered infrastructure, along with its commitment to sustainability and circular economy objectives, stood out. Their advanced waste management systems create value-added products from materials often discarded in the US. However, I observed that the US excels in air and water quality management, with stricter PFAS regulations and cleaner water discharges.

This experience profoundly influenced my academic and career goals. I aim to apply global perspectives, strengths, and challenges to my future work. I am deeply grateful to the professors, staff, hosts, and friends who contributed to this unforgettable international learning experience. I highly recommend studying abroad to anyone interested in gaining a broader understanding of global environmental issues and practices.



GAVIN VALENTINE

In August 2024, I traveled with Auburn's Engineers Without Borders program to Quesimpuco, Bolivia. EWB has been working with the community since 2019 on developing a gravity-fed irrigation system to allow the community to grow crops during their dry season. This summer, we worked on constructing a water storage tank close to the fields that will be serviced.

During the trip we were able to excavate the foundation and set up the rebar cage in preparation for the formwork and pouring of concrete. In addition to the construction, we collected data for future implementation projects. This included mapping the farm fields and the future routes for the pipe to transport the water with ArcGIS. This trip was a once in a lifetime experience as I was not only gaining engineering experience, but I was able to connect with the community and see the profound impact that our project has had.

After we were done working, we were able to have two cultural days where we got to interact with the community of Quesimpuco and explore the capital city of La Paz. The community hosted a market day, a church service, and even a soccer game. While in La Paz, we got to try new foods, travel around the city, and explore the shopping district. It was overall an amazing experience and I look forward to continuing work with my team members and the community of Quesimpuco.



> farm-ng

95% JOB PLACEMENT
within six months of graduation



SENIOR DESIGN

Auburn University Dining Hall Green Food Waste Composting Facility Design



Conservation of South Rigolets Island



Highway 14 Force Main Replacement



Designing a Composting Facility for the Auburn University Wellness Kitchen



South Rigolets Island Restoration

Island and River Restoration for Grand Bay, MS

Drying and Repurposing Biosolids for Alternative Applications

City of Auburn Wastewater Treatment Facility Biosolids Drying System

Crump Center Rain Garden Design, Montgomery, AL

Rain Garden Design for Crump Senior Center

Sense and Spray: Sensor-Based Spray System for Specialty Crops

CLICK FOR MORE PROJECTS





BIOLOGICAL & AGRICULTURAL TECHNOLOGY MANAGEMENT

The Biological & Agriculture Technology and Management (BATM) major offers students a dynamic, hands-on learning experience, equipping them with the skills to design and develop cutting-edge agricultural and biological equipment. In Spring 2024, the senior design capstone class developed a Sense and Spray system for specialty crops, designed to minimize chemical inputs and reduce costs through precision application.

This innovative system was initially developed for blueberry bushes, but can be adapted to other horticultural crops. Unlike traditional units that operate in an “all or nothing” fashion, the Sense and Spray system detects the height and location of the crop, spraying only where necessary to avoid over-application. The primary goal was to design, build, and test a PLC-based system capable of determining when to apply spray treatments based on crop height and spacing, ultimately reducing insecticide and fungicide use.

The system design features a sprayer boom with five vertically mounted nozzles on an ATV bed. Two optical proximity sensors are positioned 12 inches ahead of the nozzles to optimize spray coverage. The nozzles are divided into upper and lower zones to account for plant height variations, controlled by solenoids and a PLC.

The system is powered by an AC/DC bank and includes a 25-gallon spray tank, all mounted on a modular base within the ATV bed.

To evaluate accuracy and coverage, spray cards were used at different positions on blueberry bushes with varying foliage densities (full, medium, and thin). Data showed minimal variation in right, left, and top coverage but significant differences in front coverage based on leaf density. The results revealed that with sensors activated, the system used 43.08 gallons per acre, compared to 75.63 gallons per acre with traditional constant spraying, an efficiency increase of 43%.

The SC/ST 80-04 nozzle was selected for its optimal spray distribution and higher GPM output. The Sense and Spray system proved capable of delivering substantial cost savings per acre, depending on the chemical used: \$24.35 for Pyrethrin, \$9.14 for Captan, \$7.06 for Quadris, and \$8.04 for Actara.

In conclusion, the Sense and Spray system significantly reduces the use of insecticides and fungicides on specialty crops, offering both environmental and economic benefits while enhancing precision in agricultural applications.



CAPSTONE SHOWCASE

New this year is a college wide Capstone Design Poster Showcase that was organized by the Samuel Ginn College of Engineering Dean's office. More than 300 students (representing over 90 capstone design teams) from engineering academic programs including Biosystems Engineering participated in the design showcase.

As part of the showcase, graduating seniors have the opportunity to demonstrate their ability to communicate to a range of audiences, as this skill is critical to the success of a practicing engineer. Posters were judged by faculty, graduate students, and industry professionals. Representatives from two of the Biosystems Engineering senior design teams took first and second place in the overall poster competition category.

Seniors Ayden Kemp, Melisa Shaffer, and Grace Wood placed first for their project titled, *AU Dining Hall Green Food Waste Composting Facility*. Their goal is to design a composting facility that can divert 150 tons of food waste annually from the Auburn University Wellness Kitchen.

The design objectives for this project were to develop a proof-of-concept budget, timeline, and operations protocol for a pilot composting program for Auburn University including the construction of the composting facility, the diversion of waste from the Auburn Wellness Kitchen, and the running and management of the facility with a total first-year budget of \$125,000

Seniors Justus Smith, Ann Inskeep and Easton Foreman placed second in the competition for their design titled, *Designing an On-Campus Pilot Composting Facility for the AU Wellness Kitchen*. Their goal is to manage pre-consumer green kitchen waste from the Auburn University Wellness Kitchen, including transportation of waste, management of waste on site, and storage of waste after complete composting. The building footprint for the proposed facility, a storage shed located in the Auburn University Research Park, was modified in order to contain an efficient, turn-bin composting system.



COASTAL RESTORATION

One of the 2023 capstone senior design projects involved developing erosion management plans for four small, unnamed islands in Perdido Bay. The decision to work in Perdido Bay was driven by the active erosion threatening these islands, which had not yet been addressed by any management plans. While larger islands like Rabbit and Robinson are being managed by The Nature Conservancy, the smaller islands lacked any form of erosion control, making them a priority for the students' efforts.

Following their work in Perdido Bay, the students expanded their focus to South Rigolets Island in Grand Bay, Mississippi, in 2024. Grand Bay was selected for this project due to the rapid erosion of South Rigolets Island, which is resulting in the loss of vital wetland habitats. Additionally, the students explored the potential for floodwater diversion from the nearby town of Moss Point, which has been experiencing flooding from the Escatawpa River. By diverting this floodwater through Grand Bay marshes, they hoped to slow the erosion and enhance the habitat in Grand Bay.

These projects were unique among senior design projects because they were funded by the National Academies of Science and Engineering Gulf Restoration Program. This funding provided students with the opportunity to travel to the study sites, offering hands-on learning experiences in coastal and natural resource management and engineering.

The projects also featured a collaboration with students from Landscape Architecture (LAND) and Forestry. While BSEN students focused on engineering and site design, LAND students worked on integrating human and ecological land uses, and Forestry students concentrated on natural resource management.

In 2024, the students partnered with the Grand Bay National Estuarine Research Reserve (NERR), an 18,000-acre area that includes salt marshes and bayous unique to the coastal region. Grand Bay NERR plays a critical role in researching coastal issues, educating the public on coastal sciences, and managing their land resources.

Reflecting on the contributions of this group, it's clear that they took on a complex and large-scale project that required careful consideration of multiple environmental and engineering challenges. Their work not only addressed immediate erosion issues but also contributed to the broader understanding of coastal management and restoration.

THE CLASS OF 2024

BIOSYSTEMS ENGINEERING



BIOLOGICAL & AGRICULTURE TECHNOLOGY MANAGEMENT



BSEN BY THE NUMBERS

FALL 2024

UNDERGRADUATE:

172

ENGINEERING
STUDENTS

33

TECHNOLOGY
STUDENTS

GRADUATE STUDENTS:

53

Master's: 21
PhD: 32

FACULTY:

23

5 Licensed PEs
3 Leadership Appointments

STAFF:

12

Research: 8
Administrative: 4

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