

**NC STATE**

Engineering

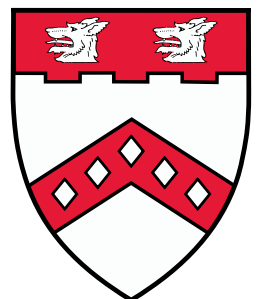
# CCEE NEWS

DEPARTMENT OF CIVIL, CONSTRUCTION,  
AND ENVIRONMENTAL ENGINEERING  
NC STATE UNIVERSITY | FALL 2019



## STEEL BRIDGE TEAM TAKES FIRST PLACE IN MULTIPLE CATEGORIES AT CAROLINAS CONFERENCE

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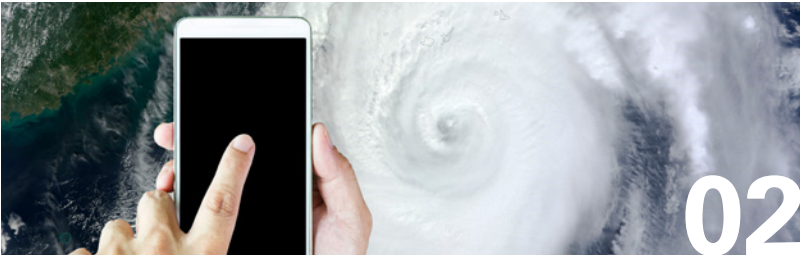
CCEE News is published by the Department of Civil, Construction, and Environmental Engineering to share information among faculty, staff, students, alumni and friends of the department.



## IN THE SPOTLIGHT

NEW COURSE INTRODUCES STUDENTS TO CIVIL ENGINEERING SUSTAINABILITY CONCEPTS PAGE 18

The newly required CE 250 introduces students to the economic, environmental, and social elements that support sustainability.

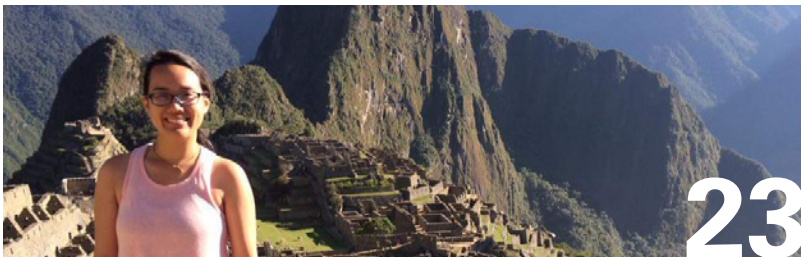


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ABOUT THE COVER

Steel Bridge Team in action earning first place in Construction Speed at the Carolinas Conference hosted at NC State.

From left to right: Thomas Clunan (BSCON 2019) Caleb Sawyer, (upcoming CE graduate Fall 2019), and David Zabel (BSCE 2019). Other builders included Kadin White and Kenneth Winslow, both civil engineering students slated to graduate in the spring of 2020.

# LETTER FROM THE DEPARTMENT HEAD MORTON A. BARLAZ



Dr. Morton Barlaz

Dear Alumni and Friends of the Department:

Welcome to our Fall 2019 newsletter. Along with the buzz that the return of students brings, we are starting our last academic year in Mann Hall as construction on Fitts-Woolard Hall continues to progress. I recently completed a tour of the interior. Our labs, offices and classrooms are taking shape and becoming a reality.

In this issue, we feature a selection of our work on many different aspects of civil infrastructure. As described on pages 02-06, our research has important impacts in areas from bridge testing in Alaska, to the provision of safe drinking water, to the use of social media to assist in disaster response, and finally an analysis of whether the now pervasive electric scooters are actually environmentally friendly. In each case, we are conducting unbiased and transparent research to develop answers that help state agencies, city utilities and engineering design firms. On this latter point, I am proud to point to the contributions of Glenn E. Futrell Distinguished University Professor

Dr. **H. Christopher Frey**, who chaired the U.S. EPA’s Clean Air Scientific Advisory Committee (CASAC). CASAC provided science-based, data-driven recommendations on a safe concentration of ground level ozone, but EPA deviated from some of CASAC’s advice in finalizing a new ozone standard in 2015. At this time, more than 120 million people in the U.S. are exposed to unhealthy levels of ozone. Recently, the U.S. Court of Appeals ruled that the EPA must follow CASAC’s guidance. Frey has been a champion for science throughout this process and I view this as public service at the highest level — using science and data to protect human health.

We are pleased to welcome Dr. **Ali Hajbabaie**, who is joining our Transportation Systems group. Hajbabaie earned his Ph.D. at the University of Illinois at Urbana-Champaign and conducted postdoctoral research at our Institute for Transportation Research and Education before joining Washington State University in 2014. Read more on page 15. In addition, we hired Dr. **Meagan Kittle Autry** to serve as the Director of Graduate Professional Development. Autry has taught a technical writing class in the department for several years and will expand her activities to help prepare our graduate students for successful careers in engineering. We bid a fond farewell to Dr. **Alejandra Ortiz** who will join the faculty at Colby College in Maine.

In each newsletter, I ask readers to consider making a financial contribution to the department. I am most appreciative and humbled by your support and commitment to our success. Your financial support allows us to enhance our academic programs and helps us to recruit and retain the very best students and faculty in the world. I am trying to increase the percentage of our alums who give back to the department. At present, only about two percent of our alums are supporting the department annually. Imagine the programs that we could support if this number increased to five or even 10 percent. As described on page 26, your contributions help ensure that we continue to offer the very best education to our students.

On a personal note, in July I made my 11<sup>th</sup> trip to Baxter State Park in Maine where I once again had the opportunity to ascend Mount Katahdin, the northern terminus of the Appalachian Trail. My trip always provides me with time to think about all of the different ways in which our profession promotes the well-being of society. I am proud to be part of the engineering community and awe-inspired by our collective accomplishments and contributions.

Please let me know if you are in the area and would like to tour our facilities. Hoping that each of you had some relaxation over the summer and have started a productive fall.

Morton A. Barlaz

Distinguished University Professor and CCEE Department Head

## CCEE AT NC STATE SUSTAINABLE INFRASTRUCTURE FOR SOCIETY

- 19.2 million in research expenditures
- 226 ongoing research projects
- 14 winners of CAREER and other NSF young faculty awards
- 53 faculty members
- 334 graduate students
- 756 undergraduate students





## RESEARCH UPDATES



### Does the use of social media during hurricanes contribute to community resilience?

Civil engineers work in many ways to help communities prepare and recover from hurricanes. For example, civil engineers predict storm surge, plan for storm water drainage, assess structural damage, and plan for effective evacuation routes. Community resilience can also be affected by the means that people use to seek help and resources during an emergency.

Dr. **EMILY BERGLUND** and Ph.D. student **MORGAN DICARLO** are exploring how and why social media platforms are used during hurricanes to seek emergency aid. With help from stakeholders including the Cajun Navy and CrowdRelief.net, Berglund and DiCarlo collected 37,000 tweets and 800 rescue logs related to the hurricane season of 2018. They created a social media use survey and distributed it to more than 450 people in hurricane-affected counties of coastal North Carolina and the Florida panhandle. Funds were provided by a rapid response grant from the CCEE Department.

About 12 percent of survey respondents said they used social media to find key supplies like food, water, and fuel during the hurricane. The research explored what motivates people to rely on social media to find essential help. Two factors that were

found to predict an intention or motivation to access social media during a hurricane were an individual's attitude toward, and confidence using, social media. The research team also found that the likelihood of posting a request for help is based on whether or not an individual charged a mobile device before the storm and the severity of damages at the home.

Based on these insights about behaviors and decision-making, Berglund and DiCarlo are developing a model to simulate communication dynamics during a hurricane. Their model will test how many people receive help based on the number of connections, such as followers, within their social media networks and the intensity of a hurricane. "The power of collecting social data and conducting surveys goes beyond an understanding of human behavior alone. We use the data to help create new modeling tools to generate operational knowledge for managing infrastructure and community resilience," Berglund said. By developing an understanding of the interactions between social networks and infrastructure systems, engineers and planners can better allocate resources to meet people's needs during disasters. ■

### Can retrofitting ensure the seismic resilience of one of Alaska's largest bridges?



Ph.D. student Victor Calderon tightens bolts on the base of the test fixture.

In Anchorage, Alaska the Port Access Bridge survived the magnitude 7.1 earthquake in November 2018 with little damage, but the bridge remains vulnerable. The half-mile long bridge is a vital lifeline that connects the port and downtown in Alaska's largest city. The bridge was designed and constructed in the early 1970s, and now the Alaska Department of Transportation & Public Facilities (AKDOT & PF) is concerned about its overall seismic safety. "While the bridge was state-of-the-art when it was built, in the decades since then, knowledge, technology, and design codes have clearly changed," said **DR. MERVYN KOWALSKY**, the principal investigator of a CCEE research team working closely with AKDOT & PF to study the earthquake resilience of the bridge, in order to determine how to retrofit it to meet today's standards. The research team includes co-investigator Dr. **JIM NAU** and doctoral students **ARIADNE PALMA**, **DIEGO MARTINEZ**, and **VICTOR CALDERON**.

The team created a three-dimensional structural model to enable dynamic analysis of the entire bridge under various earthquake events. Results of these analyses confirm field observations of little to no damage following the November earthquake. The second research need is to determine the structural capacity of critical welded steel connections. Two



Pictured above are undesirable weld fractures and retrofit scheme.

half-scale structural connections will be fabricated and tested to failure in the Constructed Facilities Laboratory on NC State's Centennial Campus. The first test has been completed, and work on the second is underway.

On the basis of the analytical work completed so far, and the results of the first connection test, retrofitting may be required to enhance the seismic capacity of the bridge. The research team will utilize previous research, also conducted with funding from AKDOT & PF, which resulted in a technique that may be adapted to the Port Access Bridge.

The retrofit design consists of the addition of an outer two-piece pipe stub welded to the underside of the cap beam. The space between the column and the pipe stub is then filled with high strength grout. This system forces earthquake damage to occur in the base material of the column, away from critical welds, and results in failure that is predictable and controllable. ■





## Leaders in Research on Per- and Polyfluoroalkyl Substances (PFAS)



Bottom, left to right: Dr. Abigail Joyce and Dr. Noelle DeStefano sample raw drinking water from a laboratory tap at the City of Sanford Water Filtration Plant.

*“A key challenge with managing PFAS is the class contains thousands of compounds. For many of these compounds we lack toxicological data, occurrence data, and analytical methods. In our research, we are developing new analytical approaches to identify PFAS, determining routes of exposure, and developing treatment approaches to reduce exposure.”*

**DR. DETLEF Knappe**

S. James Ellen Distinguished Professor in CCEE

Per- and polyfluoroalkyl substances (PFAS) are a class of pollutants that are found frequently in drinking water. Exposure to PFAS has been linked to adverse health effects including cancer, immune deficiency, ulcerative colitis, elevated cholesterol, and thyroid disease.

CCEE researchers are studying where PFAS are found and how they are transported in the air, soil, and water. Multi-disciplinary teams are studying how to treat drinking water and remediate groundwater where PFAS are found and are exploring the effects of human exposure to PFAS.

PFAS are an active ingredient in firefighting foams, stain repellents on clothing and carpet, non-stick coatings on cookware and some food packaging, and water repellent fabrics. They can enter the environment at industrial facilities that release PFAS into the air through stack emissions and into surface water through wastewater discharges. Also, PFAS can contaminate groundwater through infiltration at firefighting training areas, unlined waste disposal sites, and fields receiving biosolids. Many PFAS are persistent and accumulate in people, wildlife, and plants.

In a 2016 publication with colleagues at the U.S. Environmental Protection Agency (U.S. EPA), Dr. **DETLEF Knappe** showed that high levels of previously unknown PFAS are present in the Cape Fear River watershed of North Carolina, an important drinking water source for more than one million North Carolinians. This finding, along with the identification of many other PFAS-impacted locations across the U.S., has made PFAS research a priority.

### WHERE ARE PFAS OCCURRING?

A key question for many is whether PFAS are present in their water and wastewater. With Dr. Lee Ferguson (Duke University) and postdoctoral research associate Dr. **NOELLE DESTEFANO**, Knappe’s team is

sampling and analyzing the source water of NC’s 450+ municipal and county drinking water systems for PFAS by targeted and non-targeted mass spectrometry approaches. And with Dr. **MORTON BARLAZ**, the team has sampled both raw and treated wastewater from 30 wastewater treatment plants that comprise over 20 percent of the total wastewater flow in the state. Results are being shared with drinking water providers and wastewater treatment plants on an ongoing basis, and the findings will be summarized in a report to the NC legislature in December 2019.

PFAS can also enter the environment through releases from landfills. Barlaz and his team are sampling 15 landfills that receive municipal solid waste and other non-hazardous industrial wastes, as well as landfills that receive construction and demolition waste. The latter category of landfills are generally not lined, so leachate may be released directly to the environment. To further characterize the potential for PFAS releases from landfills, Barlaz, in collaboration with Drs. Jennifer Field and Staci Simonich (Oregon State University), will measure the presence of PFAS in landfill gas.

*“We have almost no information about the levels of PFAS in landfill gas. We will sample at 20 landfills throughout the U.S.”*

**DR. MORTON BARLAZ**

CCEE Department Head

The recent identification of GenX and related compounds has also led to questions about PFAS fate and transport in the subsurface and how these compounds are taken up by food that is grown, raised, or caught in PFAS-impacted areas. Knappe is collaborating with Dr. **OWEN DUCKWORTH** (Crop and Soil Science, NC State) and other researchers to study the interaction between PFAS and soil and the uptake of PFAS by plants. Postdoctoral research associate Dr. **CECILE ZHI** is beginning a greenhouse study and developing analytical approaches to determine PFAS levels in food.

### WHO IS EXPOSED TO PFAS?

To assess human exposure, Knappe is collaborating with Dr. **JANE HOPPIN** (Biological Sciences, NC State) to assess current exposure to PFAS in people living in the Middle and Lower Cape Fear River Basin. Postdoctoral research associate Dr. **NADINE KOTLARZ** is measuring GenX and other PFAS in blood, urine, and drinking water to help answer questions about PFAS exposure for North Carolina residents. Blood and urine samples have been collected from about 500 North Carolinians living in Wilmington and in the vicinity of a fluorochemical plant near

Fayetteville. To date, PFAS levels in blood have been shared with residents living in Wilmington.

*“One of the unique challenges of this work is communicating exposure data to the public on chemicals that have never been measured in people before, and for which there is no previously published health effects research.”*

**DR. NADINE KOTLARZ**

### HOW CAN WE TREAT PFAS?

Researchers in the CCEE Department are also leading efforts to develop and assess treatment approaches for PFAS. Dr. **DOUGLAS CALL**’s research team is investigating whether applying a small amount of electricity to activated carbon can improve the ability of PFAS to “stick” to the surface, and then “unstick” later for treatment. This approach could enable in-situ regeneration of the activated carbon.

*“If our tests are successful, then we could enhance activated carbon’s ability to remove a large spectrum of PFAS. This is promising for treatment in a wide range of environments, including drinking water.”*

**DR. DOUGLAS CALL**

To remove PFAS from water, Knappe is also collaborating with Dr. **WEI GAO** (Textile Engineering, NC State) and Dr. Kevin O’Shea (Chemistry, Florida International University) to develop cyclodextrin-modified graphene oxide materials. Cyclodextrin associates strongly with PFAS and can be modified to regenerate in-situ to release PFAS in slightly basic solutions. Postdoctoral research associate Dr. **DANNI CUI** has been developing approaches to link cyclodextrin to graphene oxide and assess its effectiveness for PFAS removal.

Knappe and his team are also studying PFAS removal by activated carbon adsorption and ion exchange processes. Results from these studies will provide the basis for models to predict treatment performance and conduct life cycle analyses. The team is working with drinking water providers across the United States, and the findings will provide guidance for providers and remediation engineers to select cost-effective treatment approaches for PFAS removal.

Results from these research projects are expected to answer important questions raised by residents in PFAS-impacted areas and will lead to the development of management and treatment approaches to reduce human exposure to PFAS. ■



# Are shared dockless e-scooters good for the planet?

Anyone who lives in a city or near a college campus has probably seen e-scooters. Designed for short-distance travel, these devices have a small electric motor and deck on which a single person stands. Ride share companies such as Bird and Lime rent out scooters by the minute, and riders leave them at their final destination to be claimed by the next user or picked up later for charging. Ride share companies promote them as an environmentally friendly choice that reduces dependence on cars, touting the environmental benefits of their “carbon-free” and “earth-friendly” rides.

To properly assess these claims, it is important to consider all relevant environmental factors, including the materials and energy required to manufacture scooters, the impacts of collecting them daily for charging and redistributing, and the electricity that charges their batteries. Dr. **JEREMIAH JOHNSON**, working with graduate student **JOSEPH HOLLINGSWORTH** and undergraduate **BRENNA COPELAND**, used life cycle assessment to determine the environmental impacts of these shared dockless e-scooters.

To understand what materials go into each scooter, the researchers took apart an e-scooter and inventoried the 13 pounds of aluminum, 2.5-pound lithium-ion battery, electric motor and various plastic and steel parts. Manufacturing these scooters and other electronic products has effects at the mine site, the smelter, and the factory. For e-scooters, they calculated that these production impacts often exceed half of the total impacts caused by each mile of travel on a scooter.

E-scooter companies employ independent contractors to collect, charge and redistribute the scooters to desirable locations. These collectors typically drive their personal



Joseph Hollingsworth and Brenna Copeland break down an e-scooter. Photo by Jeremiah Johnson.

automobiles to round up as many scooters as they can, then charge them at home, and return them the next day. The logistics are not optimized, which leads to unnecessary driving on the hunt for scooters, with this mileage generating over 40 percent of the total environmental impacts of e-scooter use.

Overall, their study found that driving a car is almost always less environmentally friendly than using an e-scooter. However, when only one-third of e-scooter rides displace automobile travel, as surveys indicate is the case, the use of e-scooters likely increases overall transportation emissions by drawing people away from walking, biking, or taking public transit. ■

Row of e-scooters in Santiago, Chile. Photo by Jeremiah Johnson.



# AWARDS & HONORS



Sankar Arumugam

Dr. **SANKAR ARUMUGAM**, Professor and University Faculty Scholar, was invited to make a presentation on spatio-temporal patterns of national water use at a workshop organized by the National Academies and Sciences in Washington DC. He also provided his expert opinion on National Water Infrastructure Resiliency and

Climate Change to the US Government Accountability Office, which is a federal legislative branch agency that serves as an advisory body for Congress and the executive branch. The expert assessment is based on an article he co-authored for the US Global Change Research Program as part of the fourth National Climate Assessment.



Top row from left to right: Mohammad Ali Khaksar Fasaee, Jacob Monroe, Liz Ramsey, and Jorge Pesantez. Bottom row: Emily Berglund, Michael Skarbek, and Morgan DiCarlo.

Dr. **EMILY BERGLUND**, Professor of Environmental Engineering, received a 2018 Outstanding Graduate Faculty Mentor Award from the NC State Graduate School. She was selected based on her exemplary track record of outstanding mentorship. Since

joining NC State, she has worked with two postdocs, eight Ph.D. students, six master’s students and sixteen undergraduates. A number of her undergraduate students have continued to graduate

school and a current Ph.D. student who worked with Berglund as an undergraduate was awarded an NSF Graduate Fellowship.



Left to right: Carrie McLean, Tarek Aziz, and Bret Smith.

Dr. **TAREK AZIZ**, Assistant Professor of Environmental Engineering, received the 2018-19 NC State Advising Administrator Award. He was recognized for his advocacy on behalf of his advisees, and his use of assessment to continuously improve the advising process.



H. Christopher Frey

Dr. **H. CHRISTOPHER FREY** received the 2019 Frank A. Chambers Excellence in Air Pollution Control Award from the Air & Waste Management Association. Frey is the Glenn E. and Phyllis J. Futrell Distinguished University Professor and a 25-year faculty member

in CCEE. His research addresses the continuum between energy use, emissions and exposure to air pollution, as well as tools and techniques for developing policy-relevant insights. The Chambers award recognizes outstanding achievement by an individual in the science and art of air pollution control.

Dr. **MOHAMMED GABR**, Distinguished Professor of Civil Engineering and Construction, received an NC State Alumni Association Distinguished Graduate Professorship Award. The award recognizes outstanding graduate-level teaching.



# AWARDS & HONORS



Left to right: Daniel C. Gunter III, Benny Suggs, Mo Gabr, and Chancellor Randy Woodson.

Gabr has been active in every aspect of graduate education including the development and delivery of courses, the supervision of graduate student research, and publication in scholarly journals.

In addition, he has facilitated and enhanced graduate education in CCEE, the university, and nationally.

Dr. **DAVID W. JOHNSTON**, P.E., Edward I. Weisiger Distinguished Professor Emeritus in Construction Engineering, was awarded the Distinguished Examination Service Award by the National Council of Examiners for Engineering and Surveying at the 2019 annual meeting in Washington, DC. Johnston spearheaded the development of the PE civil exam's construction engineering module, which was introduced in 2008. He was among the first to recognize the growth of construction engineering as a distinct body of practice within civil engineering and to identify the need for a separate construction engineering exam module. To date, over 33,000 exam takers nationally have elected that module.



David Johnston



Richard Kim

Dr. **RICHARD KIM**, Jimmy D. Clark Distinguished University Professor, received the Alexander Quarles Holladay Medal for Excellence, the highest honor bestowed by NC

State and the University's Board of Trustees. Kim was recognized by Chancellor Randy Woodson during the Celebration of Faculty Excellence and was also recognized at the University-wide spring commencement ceremony. He was recognized for his cumulative contributions to the development of fundamental and mechanistic-based test methods and models for the performance prediction of asphalt materials and pavements. Kim has made significant strides in implementing these methods and models in routine design methods and specifications that are used nationally and internationally by highway agencies and contractors.



Sami Rizkalla

Dr. **SAMI RIZKALLA**, Distinguished Professor Emeritus, was honored at several events during the Spring 2019 American Concrete Institute (ACI) Convention and Exposition in Quebec, Canada. Two technical sessions on fiber reinforced polymers (FRP) and an evening reception were held in his honor. Rizkalla is a structural engineer whose pioneering research contributed to the widespread adoption of FRP as a mainstream material for reinforcement of concrete structures around the globe. His research has advanced this now well-recognized technology both as internal reinforcements for new construction and as external reinforcements for rehabilitation of existing structures.



Brina Montoya (left), and Provost Warwick Arden

at all levels. Recipients become members of the Academy of Outstanding Teachers.

Several faculty were recognized for their outstanding teaching. Drs. **BRINA MONTOYA** and **JOSEPH DECAROLIS** both received an Outstanding Teacher Award. This award recognizes excellence in teaching



Joseph DeCarolis (left), and Warwick Arden



Left to right: Fernando Garcia Menendez, Douglas Call, and Warwick Arden

importance of the course in their own training, a significantly enhanced website, and an implementation of TopHat, a student engagement tool that enables interactive student polling during class, animations, and in-class quizzes.



Left to right: Marina Weissman, Rachel Wilcox, and Logan Herman

The NC State Environmental Engineering senior design team, "Bulk Busters," won the North Carolina Water Environment Federation (WEF) Student Design Competition in May 2019, with their project "Smith Creek Water Resource Recovery Facility Expansion and Upgrade" **RACHEL WILCOX**, **MARINA WEISSMAN**, and **LOGAN HERMAN** represented the team at the state competition. Other team members include **ELIZABETH KNOWLES**, **BRAD LASELVA**, and **SCOTT THOMPSON**. The team qualified for the national competition at the 2019 Water Environment Federation's Technical Exhibition and Conference (WEFTEC) in September in Chicago. The instructors for the design team were CCEE's Dr. **FRANCIS DE LOS REYES, III**, and Dr. Michael Wang from Hazen and Sawyer.

Drs. **FERNANDO GARCIA MENENDEZ** and **DOUGLAS CALL** received the Gertrude Cox Award for Innovative Excellence in Teaching and Learning with Technology. Together, they redesigned the junior level introductory class in environmental engineering (CE 373) to include interactive visualization and infographics that enhance problem solving skills, introductory videos from alumni discussing their careers and the

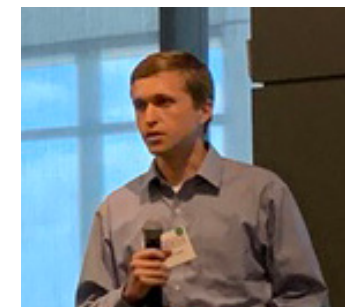


Morgan DiCarlo and Wesley Lauer, Chair, Environmental and Water Institute Student Council

PA in May 2019. Her poster was entitled "Social Media Use in Hurricanes Florence and Michael." In her research, Morgan applied the Theory of Planned Behavior to understand what motivates people to use social media to reach out for help during hurricanes. This insight can be used to better allocate resources for emergency planning. DiCarlo is advised by Dr. **EMILY BERGLUND**.



Sadia Afrin



James East

Activity in Socially Vulnerable Communities of the Southeastern U.S." She is advised by Dr. **FERNANDO GARCIA MENENDEZ**. **JAMES EAST**'s presentation title was "Sensitivity of Particulate Matter Pollution to Emissions Sector Changes in a Latin American Megacity." He is also advised by Menendez.

**MORGAN DICARLO**, Ph.D. student in environmental engineering, received the first place award in the student poster competition at the American Society of Civil Engineers (ASCE) World Environmental and Water Resources Congress in Pittsburgh,

At the fifth annual NC BREATHE Conference held in April at Cape Fear Community College in Wilmington, NC, two CCEE graduate students won Best Poster Awards, and another two of our graduate students were invited speakers based on excellent abstracts they submitted. The one day event focused on environmental justice in North Carolina and how health professionals, researchers, communities and policymakers can work together to protect vulnerable communities. **SADIA AFRIN**'s presentation was entitled "Public Health Impacts of Intense Prescribed Burn



# AWARDS & HONORS



Maksim Islam



Megan M. Johnson

**JACOB MONROE**, Ph.D. student in environmental engineering, received a National Science Foundation (NSF) Graduate Research Opportunities Worldwide (GROW) award to study at the University of Adelaide in Australia. His project entitled, “Evaluating Peer-to-Peer Blockchain Enabled Trading Platforms,” will focus on peer-to-peer energy trading within residential neighborhoods. Jacob’s advisor is Dr. **EMILY BERGLUND**.



Russell Nasrallah

**RUSSELL NASRALLAH**, a master’s student in coastal engineering, was selected as a recipient of the 2018 Anchor QEA Scholarship, which assists graduate students in fields related to water resources, surface and groundwater quality, coastal development, habitat restoration, and contaminated sediment management. His research is focused on developing a system to predict highway impacts from storms, in particular dune erosion and overwash, along NC Highway 12 on the Outer Banks. He is advised by Dr. **ELIZABETH SCIAUDONE**.

At the same event, Best Poster Award went to **MAKSIM ISLAM**, advised by Dr. **ANDREW GRIESHOP**. The title of his poster was “Factors Contributing to Seasonality and Inter-location Variability in Emissions Measured in a Multi-year Cookstove Intervention Trial in Rural India.” **MEGAN M. JOHNSON** also won a Best Poster Award for “Uncertainty in Estimated Health and Air Quality Impacts from the 2016 Southern Appalachian Wildfires.” She is also advised by Menendez.



Elizabeth Ramsey

between drought, groundwater, migration, and social unrest in Syria. She is advised by Dr. **EMILY BERGLUND**.



Soumya Sharma

**SOUMYA SHARMA**, Ph.D. student in transportation systems, was awarded The North Carolina Railroad Company Scholarship through the American Railway Engineering and Maintenance-of-Way Association (AREMA). Soumya has interests in transportation systems operations and safety, including highways and railroads. She is presently examining the way in which autonomous trucks might traverse future highway networks when there is no driver on-board. Soumya is advised by Dr. **GEORGE LIST**.



Shivpal Yadav

**SHIVPAL YADAV**, CCEE graduate student, was accepted as a delegate to represent NC State University at the 10<sup>th</sup> University Scholar Leadership Symposium (USLS) hosted by Humanitarian Affairs Asia and the Government of Malaysia in Kuala Lumpur. The USLS is a youth leadership development program which Humanitarian Affairs Asia holds annually for youth leaders who are passionate about positive social change. ■

**ELIZABETH RAMSEY**, environmental engineering Ph.D. student, received a 2019 National Defense Science and Engineering Graduate (NDSEG) Fellowship Award. In her Ph.D. studies, she is applying agent-based modeling and inverse modeling approaches to explore the connections

between drought, groundwater, migration, and social unrest in Syria. She is advised by Dr. **EMILY BERGLUND**.

**SOUMYA SHARMA**, Ph.D. student in transportation systems, was awarded The North Carolina Railroad Company Scholarship through the American Railway Engineering and Maintenance-of-Way Association (AREMA). Soumya has interests in transportation systems operations and safety,



CCEE’s Dr. Abhinav Gupta, at podium, moderated the executive panel discussion at SMiRT 25.

## Center for Nuclear Energy Facilities and Structures Hosts 25<sup>th</sup> International SMiRT Conference



Saran Bodda, third from left, won one of three Shibata Awards.

The 25<sup>th</sup> International Conference on Structural Mechanics in Reactor Technology (SMiRT 25) was held in Charlotte, North Carolina this past August. This international conference was hosted by NC State’s Center for Nuclear Energy Facilities and Structures (CNEFS). SMiRT conferences have a strong history of contributions to the state of practice in the nuclear industry worldwide. They are held biennially, alternating between Asia, Europe, and the Americas. CCEE professor and CNEFS Director Dr. **ABHINAV GUPTA** was the Chairman of SMiRT 25.

More than 550 people from around the world traveled to Charlotte for the conference. The Honorable Commissioner David Wright of the United States Nuclear Regulatory Commission delivered the keynote lecture and National Academy of Engineering member Dr. Bob Budnitz delivered the prestigious Jaeger Lecture. Other notable industry leaders participated in the Executive Forum including the President of the Canadian Nuclear Safety Commission, Chief Nuclear Officers of the Electric

*“We shaped the technical program for SMiRT 25 to serve as a forum for germinating, communicating, and advancing scientific and technological innovations. Enhanced international collaboration, particularly for the global supply chain and in the area of educating the next generation of the workforce, were emphasized.”*

**Dr. Abhinav Gupta**

Power Research Institute, Duke Energy, Korean Hydro Nuclear Power; and the CEO of GE-Hitachi Nuclear and the Director of the Department of Energy’s Idaho National Lab.

The nuclear energy industry is seeking innovation in four broad areas:

1. Development and Licensing of Advanced and Small Modular Reactors
2. Subsequent License Renewal and Life Extension
3. Managing the Construction Cost and Schedules for New Builds
4. Decommissioning

SMiRT 25 marked the first conference to confer the Kennedy Award for best paper and the newly named Shibata Award for best paper by an early career professional. **SARAN BODDA**, a doctoral student in CCEE, received one of the three Shibata Awards for his paper entitled “Risk Informed Validation Framework of External Flooding Scenario.” Bodda’s research aims to develop and demonstrate a data-driven methodology for validation of advanced computer models used in nuclear power plant safety analysis. ■





## NEW RESEARCH PROJECTS

In the first part of 2019, CCEE launched numerous new research projects, with funding from federal and state agencies, foundations, and industry sponsors. This support will enable CCEE faculty members, their research teams, and their collaborators to address problems facing infrastructure and the environment in North Carolina and around the world. We highlight a selection of these grants.

Drs. **SANKAR ARUMUGAM, RANJI RANJITHAN** and **ANGELA HARRIS** will collaborate on a National Science Foundation (NSF)-funded grant focusing on urban flooding. The focus of the project under Phase 1 is to develop an open knowledge network for addressing urban flooding by harnessing multi-source data and information networks.

Dr. **MORTON BARLAZ**, in collaboration with researchers at Oregon State University, will estimate the mass of poly- and perfluoroalkyl substances (PFAS) in landfill gas. After developing a method to measure PFAS in landfill gas, which has never been done, the research team will test gas from about 20 landfills, measure attenuation of PFAS in soil, and develop a model to estimate nationwide emissions. This research is funded by the U.S. Environmental Protection Agency.

Dr. **ASHLY CABAS** was awarded funding by the U.S. Geological Survey to develop seismic attenuation models for low-to-moderate seismicity regions. The new model will include contributions to the dissipation of seismic energy associated with shallow and deep geologic structures, and then be integrated into seismic hazard adjustment factors. The overarching goal is to improve the assessment of site-specific seismic hazards by capturing key characteristics of the seismic wave propagation phenomenon.

Dr. **MURTHY GUDDATI** received funding from the National Institutes of Health to develop new computational methods to better quantify the stiffening of human carotid arteries, which is a well-known early indicator of cardiovascular disease. He will be working with Drs. Matthew Urban and James Greenleaf (Mayo Clinic) and Dr. Wilkins Aquino (Duke University) to validate these methods and integrate them into a medical ultrasound procedure, with the ultimate goal of routine, non-invasive measurement of arterial stiffness with high reliability.

Dr. **JEREMIAH JOHNSON** will assess the use of buildings' heating and cooling systems to provide benefits to the electric grid, with funding from the U.S. Department of Energy Building Technologies Office. Through small shifts in thermostat setpoints across many buildings, the total changes in electricity consumption can help integrate wind and solar power and ensure grid reliability. The research team will conduct experiments on a number of buildings to assess the energy efficiency implications of electric load shifting on building energy consumption.

Drs. **JOSHUA KEARNS** and **BRINA MONTOYA** are participating in an interdisciplinary program, led by the Crop and Soil Science department and funded by NSF, that will host undergraduate researchers from across the country over the next three summers to study a variety of aspects of soil. Student research opportunities highlight relationships between human activities and terrestrial environments, which are central topics in modern soil science and civil engineering.

Drs. **KUMAR MAHINTHAKUMAR, DOWNEY BRILL**, and **RANJI RANJITHAN**, via a National Science Foundation PFI (Partnership for Innovation) grant, will develop, test, and validate a proof-of-concept IoT (Internet of Things) system for leakage detection in water distribution systems. The project will integrate data from flow and pressure sensors in a water distribution network, a hydraulic model, and an NC State-developed leakage detection analytics to build the IoT system.

Dr. **ARUMUGAM** was awarded a NSF Sustainable Urban Systems (SUS) workshop grant to consider multiplex systems approaches for the management of urban infrastructure. The purpose of this workshop is to identify core issues for the next level of SUS grants to address pressing interdisciplinary problems related to urban sustainability.

Drs. **MONTOYA** and Matt Evans (Oregon State University) were awarded funding from NSF to assess the performance of coastal dunes when they are treated with bio-cementation. Bio-cementation is a natural method to strengthen sands. The Large Wave Flume at Oregon State University will be used to subject bio-cemented dunes to hurricane loading. The results of the large-scale experimental work will inform numerical simulations that will be used to optimize and design bio-cementation implementation in coastal dunes.

Drs. **JOSEPH DECAROLIS** and Paulina Jaramillo (Carnegie Mellon University) were awarded funding by the Sloan Foundation to create an Open Energy Outlook for the United States. The project will explore technology and policy pathways to achieve deep reductions in greenhouse gas emissions. Unlike previous efforts, all model code and data used in the analysis will be made publicly available. The goal is to advance the discussion of energy climate policy in the U.S. by taking an open, networked community approach.

Dr. **FRANCIS DE LOS REYES, III** will investigate how the microbial communities used for anaerobic digestion (AD) or co-digestion of food waste are affected by, and adapt to, changes in food waste type, strength, and characteristics on a seasonal, daily, or per load basis, with funding from the Environmental Research & Education Foundation (EREF). This research will lead to operational procedures that can be used in full-scale implementation of AD of food wastes by municipal utilities and industry.

Drs. **MORTON BARLAZ, JOEL DUCOSTE**, and **MOHAMMAD POUR-GHAZ** will develop laboratory methods to measure heat evolution from industrial wastes under landfill-relevant conditions. Measured heat production rates will then be used in a model of heat accumulation in landfills developed by the team over the past three years with funding from the EREF. The heat accumulation model will be used to evaluate safe quantities of reactive wastes that may be buried in landfills.

Dr. **MIN LIU** was awarded a project by the Construction Industry Institute to study the challenges and opportunities to promote collaborative scheduling in construction projects. Liu is working in collaboration with Dr. Thais Alves (San Diego State University) and Dr. Natalie Scala (Towson University). They work closely with a group of 15 construction industry practitioners to investigate barriers in the formal and informal practices of collaborative scheduling, how the barriers impact the actual implementation, and effective strategies to establish and sustain collaborative scheduling practices.

Dr. **DETLEF KNAPPE** will investigate water treatment approaches for short-chain PFAS across a wide variety of mature and emerging technologies, with funding from the Water Research Foundation. PFAS are contaminants of emerging concern for drinking water providers nationwide. This study will be used to inform environmental and economic assessments on drinking water treatment systems impacted by short-chain PFAS.

Dr. **SHANE UNDERWOOD** is conducting experiments with fiber reinforced asphalt concrete to develop pavement structural design parameters. Synthetic fibers improve the toughness and crack resistance of asphalt concrete and extend pavement lifetime. With sponsorship from the Forta Corporation, this study will provide the design inputs that are needed to properly reflect these performance benefits into the pavement design process and allow engineers to effectively deploy these materials.

Drs. **MERVYN KOWALSKY** and **RUDOLF SERACINO**, with funding from the Alaska Department of Transportation and Public Facilities, will develop strategies to strengthen the portion of bridges weakened by an earthquake and force any new damage to occur in regions of the columns that were previously undamaged. Of particular interest are techniques that could be 'built in' to new bridges that would make their repair easy to accomplish should they suffer an earthquake during the service life.

**The following projects are supported by the N.C. Department of Transportation (NCDOT).**

Dr. **ELENI BARDAKA** will investigate the spatial and temporal distribution of direct economic impacts of beltway projects on surrounding residential and commercial property values in NC. The study uses a quasi-experimental econometric method to identify the causal economic impacts induced by three major highway investments in NC including the I-540 Northern Wake Expressway, the Greensboro Southwest Loop, and the I-485 Charlotte Outer Loop.

Drs. **KEVIN HAN** and **WILLIAM RASDORF** will investigate ways to implement unmanned aerial systems equipped with cameras and LiDAR sensors for use in field surveying applications. LiDAR is a remote sensing method using pulsed laser to measure ranges. The guidelines, specifications, and



recommendations that result will allow survey-grade data to be collected and used by NCDOT Photogrammetry, Location & Surveying and GeoTechnical Engineering Units. Ultimately, the research will help NCDOT develop a department-wide implementation plan.

Drs. **POUR-GHAZ, MOHAMMAD GABR**, and **KNAPPE** will investigate the rate and magnitude of contaminant migration through materials used in construction of subsurface utilities, and the impact of contaminants on the materials' durability. Contaminated subsurface profiles are common and are mainly caused by underground storage tanks, old unlined landfills, dry-cleaning solvent ponds, or abandoned industrial and agricultural operations. This project includes both laboratory and field measurements.

Drs. **POUR-GHAZ, GREG LUCIER**, and **GABR** will develop culvert material selection guidelines that factor in the environmental exposure condition of culvert pipes. A large number of culverts are installed during construction projects. While these culverts are selected based on the required structural performance, exposure conditions and susceptibility to corrosion have received less attention in the selection criteria.

Drs. **LUCIER** and **POUR-GHAZ** will study the effect of non-metallic fibers on the development and extent of cracking in the high-performance cementitious materials typically used in the construction of bridge deck overlays. Cracking of bridge deck overlays accelerates the physical and chemical degradation of bridges and results in a reduced service life for these structures.

Drs. **SHANE UNDERWOOD** and **CASSIE CASTORENA** will evaluate whether recent changes in asphalt mixture design procedures have resulted in positive impacts to the longevity of NC roads. The team will compare the composition of mixtures before and after the changes as well as conduct laboratory tests to see how these changes have affected the strength and long-term durability of the mixtures.

Drs. **UNDERWOOD** and **CASTORENA** will evaluate how asphalt pavement overlays affect highway safety by measuring the surface friction between tires and the roadway surface. When the surface friction is too low, vehicles may lose traction, especially in wet conditions. The project outcomes will lead to improvements in the engineering, delivery, and management of roadways in North Carolina and possible reductions in these wet collisions.

Drs. **UNDERWOOD** and **MURTHY GUDDATI** are evaluating a new type of pavement design, known as an inverted pavement, which uses less resources than traditional paving and may provide for a pavement system with reduced environmental impacts. The technique has been used extensively in South Africa and other locations, and the team will evaluate how to adapt the method to North Carolina climate and soil conditions.

Dr. **CASTORENA** will evaluate the impacts of additives on the performance of high recycled content asphalt mixtures. The use of reclaimed asphalt pavement and recycled asphalt shingles in new asphalt mixtures can conserve resources and reduce costs, but the asphalts contained in these mixtures are susceptible to cracking. The research results will establish procedures for selecting additives in high recycled content mixtures to improve pavement performance.

Dr. **BARDAKA** will study the socioeconomic impacts of current and future transit systems in North Carolina and will assist in developing equitable land-use policies and planning for affordable housing in locations that offer high access to transit. The two-year project is in collaboration with Dr. Jean-Claude Thill (UNC Charlotte).

Drs. **MONTOYA, ALEJANDRA ORTIZ**, and **GABR** will study scour at bridge foundations, which is difficult to predict but must be considered to maintain bridge stability. This project will compare multiple approaches to predict scour, and is needed to assess the robustness of the first-order scour estimates and to provide reliable quality control measures to ensure that estimates of bridge scour are appropriate.

Dr. **SERACINO**, in collaboration with Dr. Amin Akhnouk (East Carolina University), will evaluate the performance of in-service Integral Abutment (IA) bridges in North Carolina to recommend improved designs and construction practices. Expansion joints in bridge decks are costly, require regular maintenance, and often leak, resulting in accelerated deterioration of girders and bearings. IA bridges are designed to address these issues by eliminating expansion joints within the bridge deck and at the abutments.

Dr. **H. CHRISTOPHER FREY** will assess the effectiveness of a new emission control system for passenger train service between Raleigh and Charlotte. For more than 10 years, Frey's group has measured the emissions of this train service. While emissions of some pollutants are relatively low, emissions of nitrogen oxides are relatively high. The new emission control system is expected to reduce nitrogen oxides emissions by over 80 percent. ■

## Ali Hajbabaie brings expertise in traffic control systems



Dr. Ali Hajbabaie

Dr. **Ali Hajbabaie** joined the department as an assistant professor in August 2019. His research is focused on traffic operations and control in the presence of connected human-driven and self-driving cars. Hajbabaie and his research group use multi-scale analysis, modeling, and optimization to improve traffic operations. His research is advancing our understanding of cooperative traffic

control systems and contributes to the development of future mobility systems, including connected and automated vehicles.

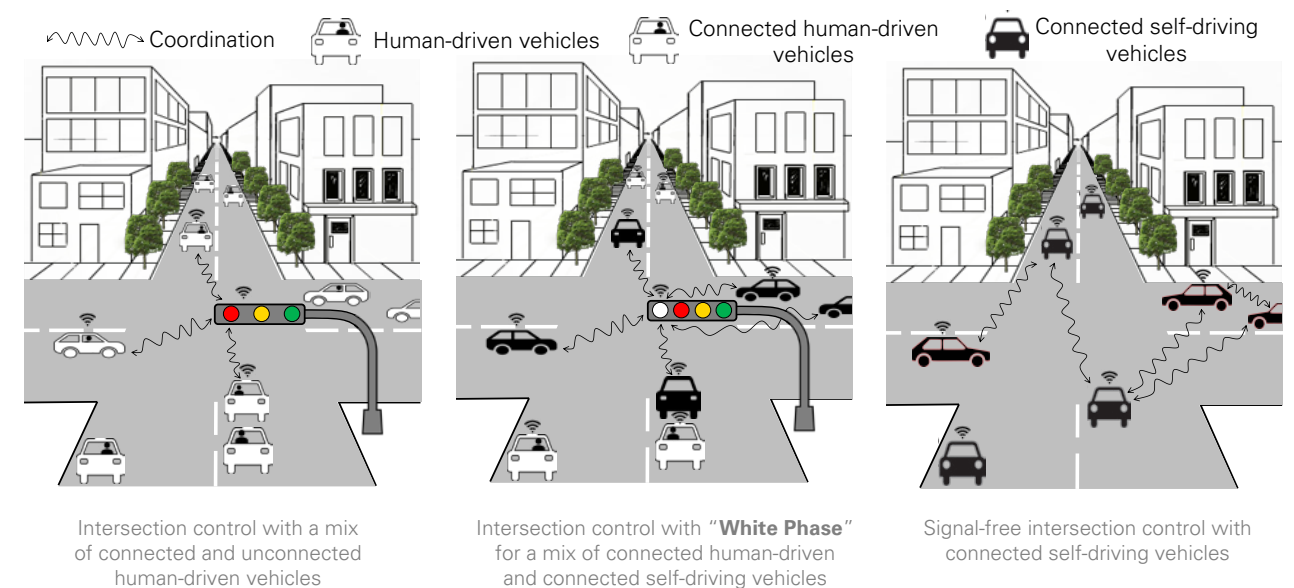
Hajbabaie earned his Ph.D. in civil engineering (2012) from the University of Illinois at Urbana–Champaign (UIUC). He received his B.S. and M.S. degrees in civil engineering in 2003 and 2006, respectively, from Sharif University of Technology in Iran. He also

earned a second M.S. in Industrial Engineering (2011) from UIUC. After receiving his Ph.D., he was a postdoctoral research scholar at the Institute for Transportation Research and Education here at NC State. He then moved to Washington State University where he was an assistant professor in the Department of Civil and Environmental Engineering from 2014 to 2019.

He has served as secretary of the Work Zone Traffic Control standing committee of the Transportation Research Board (TRB) of the National Academies of Sciences, Engineering, and Medicine since 2014 and as the Chair of the Asset Management Subcommittee of the Traffic Signal Systems Committee of the TRB. His activities contribute to the advancement of real-time optimization of large-scale complex engineering systems represented by models with a high degree of realism.

Hajbabaie will be teaching CE 305, Traffic Engineering, in the spring semester. He will also teach courses on advanced traffic control, traffic flow theory, and traffic operations, and he plans to develop a new course titled Distributed Optimization of Traffic Systems.

He enjoys table tennis and was a member of the University of Illinois table tennis team while working on his Ph.D. Beyond his professional interest in traffic systems, he is very interested in cars and spends a lot of his personal time learning about technological trends, especially with electric and automated car technologies. ■





## Former long time CCEE department head E. Downey Brill, Jr. retires

E. Downey Brill, Jr.

“Downey’s lasting legacy is observing him decisively choosing to make the right decision under difficult circumstances. His mentorship has been consistently an eye opener and he has had a profound impact on me through observing his excellent character and his selfless contributions for the greater good of our academic community.”

Dr. Mohammad Gabr

Professor **E. DOWNEY BRILL, JR.** retired in December 2018. He came to NC State in 1988 to become the seventh department head of what was then called the Department of Civil Engineering. He served in that position for 17 years. Brill received his Ph.D. from Johns Hopkins University in 1972 and then started his academic career at the University of Illinois where he progressed to the rank of Professor in the area of Environmental Systems Analysis. After stepping down as CCEE Department Head in 2005, he remained a Professor in the department until 2016 and then served as the Interim Director of the Institute for Transportation Research and Education from 2016 to 2018.

Without question, Brill transformed the department. During his tenure as department head, Brill hired about 20 faculty and infused a culture and sense of mission in the department that remains in place.

He worked in a tireless manner, with tremendous dedication to the department’s mission and well-being and has always been the department’s strongest advocate. He continues to serve as a resource to many of our faculty and has always been known for his thoughtful and creative approaches to problem solving.

The department witnessed significant growth and development during Brill’s tenure as department head. Graduate enrollment increased by nearly 75 percent and the number of Ph.D. degrees granted doubled. At the same time, undergraduate enrollment grew by 20 percent and the department established the ABET accredited B.S. in environmental engineering. In the early 1990s, the department began teaching courses through our distance education program. Today, the department has approximately 70 degree-seeking students enrolled in our Engineering Online program and we offer about 16 courses per semester to students located all over the U.S.

Under Brill’s leadership, the department added a distance education classroom as well as a computer software teaching

“A true academic whose values were always guided by what is right (and logical), and not by what is popular.”

Dr. Francis de los Reyes, III

“I consider myself very fortunate to have had him as one of my mentors when I was starting my career, and still think of him as a great example to emulate - even keeled, thoughtful, articulate, and occasionally humorous.”

Dr. Mervyn Kowalsky

“When I read Dr. Brill’s early work on (modeling-to-generate-alternatives), I thought ‘wow’ — energy modelers need to be applying his methods. I wrote a paper in 2011 introducing Downey’s work to the energy modeling community, and it has been very well-received, with several applications of his method to different energy systems.”

Dr. Joseph DeCarolis

laboratory. In addition, the department significantly expanded its activity in construction extension. Brill saw to completion two critically important initiatives: opening of the Constructed Facilities Laboratory for large-scale structural research; and establishment of the first endowed professorship in the department. Finally, the department officially changed its name to the Department of Civil, Construction, and Environmental Engineering to reflect our three ABET-accredited degrees.

In addition to being a dedicated administrator, Brill is an accomplished scholar in the area of environmental systems. His research focuses on building and applying optimization models, which are designed to inform decisions involving complex systems, including water resource allocation, land use planning, and facility siting. Many faculty members joked that his tenure as department head was a 17-year research project on a highly constrained multi-objective optimization problem.

### MORE ABOUT DR. BRILL’S RESEARCH

Brill’s research focuses on building and applying optimization models, which are designed to inform decisions involving complex environmental systems. The models include algorithms that tune (i.e., “optimize”) a set of variables to meet an objective, such as minimum cost or environment impact, subject to a set of constraints on system performance.

In the late 1960s and early 1970s, there was a growing community of researchers who were building computer models to inform environmental planning decisions. Many of these early modelers believed that their models were sophisticated enough to provide direct answers to complex problems. Much of the community was working to build increasingly complex

models and lamenting that the model results were not being implemented. Brill was among a small group of scholars rethinking the role of optimization models: rather than delivering answers, they should be used to produce insights that inform decisions. As Brill put it, “Modelers need to stop and think, how’s this really going to work?” In many cases, the modeled system is too complicated to fully capture mathematically, and making the models more complex was not going to change this reality.

One morning, Brill had a “eureka” moment. Rather than using models to find a single solution, it would be better to find feasible solutions that are as different as possible from each other, but still perform nearly as well in terms of the model’s objective. For example, suppose you are trying to site a set of industrial facilities to yield the lowest overall cost, subject to a set of constraints on land use and resource availability. Rather than building a model to find one definitive set of facility locations, it would be better to return several sets of facility locations that are maximally different with respect to the locations selected but that have nearly the same cost as the original solution. Decision makers can then evaluate these alternatives and make their own judgements, taking other unmodeled issues into account.

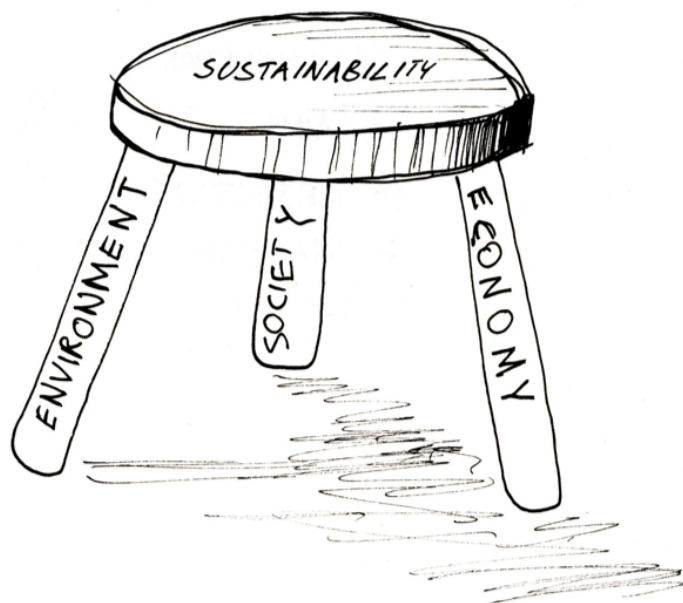
Brill rushed to campus to describe his idea to his colleague and former Ph.D. advisor John Liebman. Liebman was impressed and remarked that “it’s going to take you 10 years to work all this out.” Brill embarked, along with numerous faculty colleagues and graduate students, on a series of studies to prove the value of his new method, which he termed “modeling-to-generate-alternatives (MGA).” His early publications inspired additional work, and there are now hundreds of applications that employ MGA. The method is still being widely applied more than forty years after its conception. ■





# New course introduces students to sustainability concepts in civil engineering

You can probably think of an example of civil infrastructure that had unintended consequences — maybe it is a waste discharge that pollutes the environment, or a bridge that changes the nearby river flow and erosion. For a development to be sustainable, it should meet the needs of the present generation without compromising the ability of future generations to meet their own needs. We discuss sustainability throughout our curriculum, including in a new required course called CE 250, Introduction to Sustainable Infrastructure.



Sustainability has three core-elements: economic, environmental, and social.

Introduction to Sustainable Infrastructure is now required for all sophomores, along with introductory courses in statics and fluid mechanics. “We want students to understand the multifaceted challenges of our civil infrastructure,” Dr. **TAREK AZIZ** said. “Good engineering is not just building a long-lasting structure or a storm-water plan that prevents flooding. We wanted to show students that it’s more complex and exciting than that.”

Students are introduced to three core elements — economic, environmental, and social — that support sustainability like the three legs of a stool. The economic sustainability material has evolved from our Engineering Economics course (formerly CE 390), and it includes concepts related to the time value of money, inflation, interest, present worth analysis, and benefit-cost ratios.

“The economics material is the thickest leg. Our students will see it throughout their careers, and they have to understand how to include it in a sustainable design.”

**DR. JOSEPH DECAROLIS**

The second element is environmental sustainability, and it includes concepts related to life-cycle assessment as well as climate change risks and their effects on civil infrastructure. In one homework problem, the students are given assumptions about diesel and electric buses (such as distances per day, ridership, and fuel efficiency) and asked to estimate their life-cycle emissions.

The third element is social sustainability, and it includes concepts related to equity, awareness, stakeholder engagement and participation. Infrastructure can exacerbate disparities, but it can also spur change and promote movement in a society where infrastructure serves the entire population. Teaching concepts around stakeholder engagement and community participation introduces students to the complexity of solving real-world problems.

“CE 250 was born out of what we thought we could do better. Sustainability should be more than a buzz-word for students as they go into the workforce.”

**DR. TAREK AZIZ**

To show realistic applications of sustainable development, the course concludes with three case studies where students apply their more holistic knowledge of sustainability to explore contemporary CCEE challenges.

One case study is about coal ash impoundments, which can have problems of unlawful discharges and groundwater contamination, as has occurred in North Carolina. In a guest lecture, Montoya describes her research in developing bio-mediated stabilization approaches to improve the sustainability and resiliency of infrastructure.

As part of the case study, the students are asked to consider the remediation of a coal ash pond. They first estimate the time, cost, and environmental impacts of excavating and relocating the coal ash into engineered landfills with liners. Students then repeat the estimate for in-place treatment of the coal ash by using biocementation.



Dr. Angela Harris answers questions from sophomore Bailey Jones before the lecture begins.

“We want our engineers to not just have excellent technical expertise, but to make decisions that consider the societal impacts of projects. Engineering projects have social outcomes — health, access, risks — and introducing infrastructure more holistically is a goal of this course.”

**DR. ANGELA HARRIS**

“Students come back with an estimate of more than 10 years, and they think they’ve made a mistake,” DeCarolis said. “So we get to discuss

their assumptions and process. Even for a very simple setup, they can see the complexities of these problems.”

The course has been well-received, especially now that the first classes of students are progressing through the curriculum. “Now I want to spend a week at the end of my senior-level course, tying back to the material in CE 250,” Montoya said. “The students now have a mindset where they can apply what they’ve learned.”

CE 250 is now a place to introduce sustainability and gives students a chance to truly understand the challenges that civil engineers face every day. “Talking about the past and future of our infrastructure is a really exciting way to engage students about these topics,” Aziz said. “And while it’s not the only step that needs to be taken to help sustainability concepts stick, it’s the first step in the right direction.” ■

Because CE 250 is required for all students, its enrollment has grown to more than 120 students per semester. In the first six offerings of the course, six faculty members have shared the instruction (often as co-instructors), and others have lectured about specific case studies. From their research programs, these instructors bring expertise in domain areas such as energy and transportation systems, construction, structures, geotechnical, global sanitation, water resources, and air pollution.

Given the size of the class, the instructors have adopted methods to increase participation. In addition to online resources and guided lecture notes, real-time survey technology is used to record attendance, ask quick questions, and gain feedback from students. Three instructors (Drs. **AZIZ**, **JOSEPH DECAROLIS**, and **BRINA MONTOYA**) are recipients of the NC State Outstanding Teaching Award.



# STUDENT GROUPS

There are more than a dozen chapters of professional organizations available for CCEE students. Membership is a way to meet peers, make industry connections, strengthen leadership skills, and engage in community service. Participation offers the chance to attend conferences, compete against peers from other institutions, learn outside of the classroom, and interact with professional engineers.

## AMERICAN CONCRETE INSTITUTE (ACI)

For the sixth consecutive year, the NC State student chapter of ACI received the Excellent University Award, which acknowledges the chapter's active involvement in international student competitions, community outreach activities, and ACI conventions and committees.

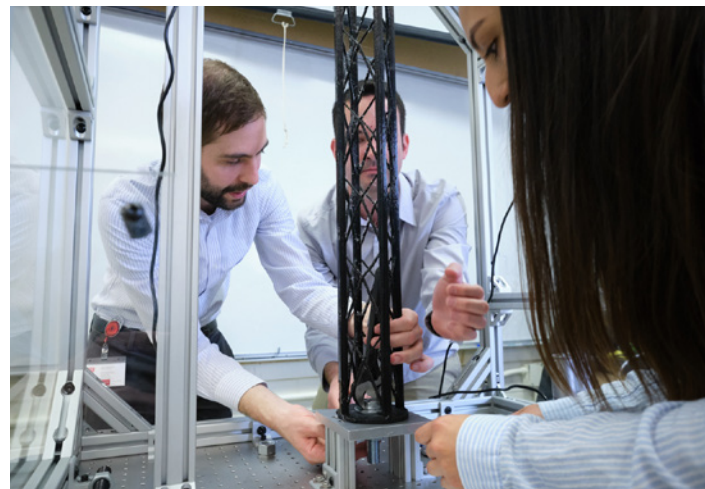
In March, ACI student chapter members joined students from around the world to participate in the 2019 International Concrete Construction Competition held in Quebec, Canada. Our eight-member team competed in the Mortar Workability Competition. The students created a mortar mixture at the site, satisfied the material requirements and mixture specifications, and demonstrated the mortar's flowability and stability. The ACI student chapter also organized the 2019 State of the Practice Concrete Symposium, honoring the late Sam Crawford, a long-time supporter of NC State's-ACI Chapter activities and students. The event, held in February at NC State's McKimmon Center, attracted more than 70 designers, specifiers, testing agencies, and facility owners. A series of speakers including Dr. **GREGORY LUCIER**, who manages the Constructed Facilities Laboratory on Centennial Campus, as well as many experts from industry, exchanged knowledge on a number of topics including the latest in concrete performance specifications, non-destructive testing, and mix specifications.

## AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE) AND AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

The student chapter of ASCE at NC State hosted the 2019 ASCE Carolinas Conference called, "Sustainable State of Mind." Concurrently, the student chapter of AISC hosted the AISC Carolinas Conference. The three-day regional conference, held on and around NC State's campus April 4<sup>th</sup> - 6<sup>th</sup> included the participation of more than 320 students from 10 schools throughout the Carolinas and Georgia. The concrete canoe competition was held at Lake Crabtree, with UNC Charlotte (UNCC) taking top honors. The steel bridge competition was held



CCEE's steel bridge team took first place in three of seven categories.



Dr. Jason Patrick initiated the new structural tower competition. He was able to display graphics in real time that simulated the effect of the lateral load acting upon the top of the towers.

on campus. NC State's five-person team, captained by **DAVID ZABEL**, took first place in three of seven categories, including construction speed, stiffness, and economy. The home team took second place, finishing very close to UNCC. "The steel bridge and concrete canoe are student-designed and fabricated. They spend many hours working together on these projects, which provide great learning experiences and are a lot of fun," said **STEVE WELTON**, faculty advisor to both the ASCE and AISC student groups at NC State.

Two new events were added this year, including a structural tower competition initiated by CCEE professor Dr. **JASON PATRICK**, and the Innovation Contest piloted by Dr. **MARC HOIT**, Vice Chancellor for Information Technology at NC State. The format of the Innovation Contest included both a poster presentation and a 'shark tank' presentation. The new events with a focus on new technologies created a strong counterpart to the more customary events, and were well received.

## COASTS, OCEANS, PORTS AND RIVERS INSTITUTE (COPRI)



Mike Remige explains the renewable energy program at Jennette's Pier.

The NC State student chapter of COPRI traveled to the North Carolina Outer Banks for their third annual spring field trip in late May. The trip included visits to the Coastal Studies Institute (CSI) in Manteo, NC; the Army Corps of Engineers Field Research Facility (FRF) in Duck, NC; and Jennette's Pier, part of the North Carolina Aquarium Society in Nags Head, NC. Scientists and engineers at these facilities are leading projects in a range of coastal issues, including topics related to research being conducted by COPRI members at NC State. "I've been working on models for beach and dune erosion during Hurricane Isabel, based on observations collected before and after the storm. It was fascinating for me to see the advanced tools that are used at the Field Research Facility," said COPRI chapter president **ALIREZA GHARAGOZLOU**. The same sentiment was echoed by Russell Nasrallah, a master's student studying coastal engineering. "I've used data from a Waverider buoy dozens of times, but it's really awesome to see one up close."

## EARTHQUAKE ENGINEERING RESEARCH INSTITUTE (EERI)



Members of the NC State Seismic Design Competition Team, left to right: Jacob Seate, Cade Karrenberg, Taylor Brodbeck, Graham Gantwood, Stephen Odom, and Anthony Pandoli.

In March, six undergraduate members of EERI traveled to Vancouver, British Columbia, to compete in the Seismic Design Competition as part of the EERI Annual meeting. Admittance to this demanding competition is based on acceptance of a detailed proposal, which the team spent months completing. Overall, 38 teams from around the globe were selected and tasked with designing a balsa wood structure while also considering architectural concepts, structural system analysis and design, construction processes, and material testing. The team's structure successfully survived the ground motions of the "shake day." In addition to the competition, three graduate students from CCEE presented posters on their earthquake engineering research during the event.

## NC SAFEWATER

The student chapter of NC Safewater took part in the Wake County Big Sweep, which occurs each fall and spring. Wake County Big Sweep is part of the International Coastal Cleanup, which is the largest litter cleanup of its kind. The student chapter coordinates the event and supplied funds to cover the cost of doughnuts and coffee for volunteers. Thirteen students participated in cleaning up along Rocky Branch Creek Trail, which runs within NC State's campus. "We not only pick up trash, but also try to sort recycling and collect data on what type of trash we find and supply that information to the Ocean Conservancy," said Ph.D. student **AMANDA KARAM**.

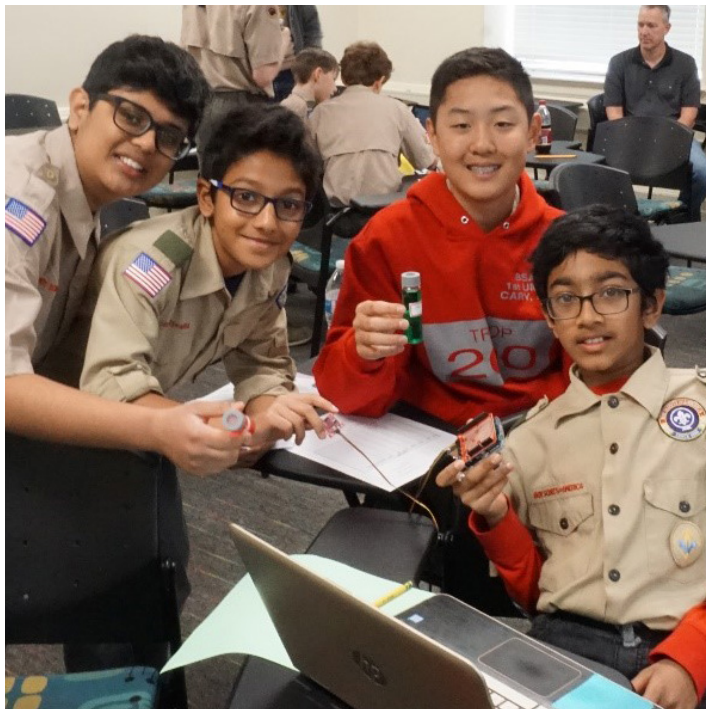




Members of NC Safewater helped clean up Rocky Branch Creek Trail.

### PROFESSIONAL ENGINEERS OF NORTH CAROLINA (PENC)

The student chapter of PENC hosted the Boy Scout Engineering Day earlier this year. As part of this event, more than 60 scouts visited the department. They were introduced to the field of Civil Engineering and opportunities that the profession offers to serve the wider society. The scouts were led through several simple experiments including the use of water column filtration to decrease water turbidity. The PENC student chapter hosts a number of events throughout the year focusing on professional mentorship, engineering licensure, and community service.



Boy Scout Engineering Day



Members of the Construction Alliance on a site tour at the Novo Nordisk pharmaceutical plant being built in Clayton, NC.

### THE CONSTRUCTION ALLIANCE AT NC STATE

The Construction Alliance organized a site visit to the Novo Nordisk Active Pharmaceutical Ingredient (API) manufacturing facility being constructed by Fluor Corporation in Clayton, NC. The facility, with 830,000 square feet of floor space, will produce pharmaceutical ingredients for diabetes medicines. It is the largest life sciences facility investment in North Carolina’s history. Fifteen students saw the latest technologies in the construction of a healthcare manufacturing facility. CCEE alumnus Justin Lamb (BSCE 2006), an on-site project manager with Fluor, led the site tour. **SAURABH RAKA**, (BSCE 2018) said the site visit helped solidify his career path. “Visiting such a massive construction site emphasized the importance of construction safety and site logistics. This is one of the largest pharmaceutical facility construction projects in the United States, but despite the size, the construction site is extremely clean. I saw many examples of safety precautions also, including a walking trail specifically for workers and visitors on which there was no vehicular traffic,” Raka said. ■

## ALUMNI FEATURE

### Alumna Christine Nguyen Herrick always accepts the greater challenge!

Christine Nguyen Herrick stands at the summit of Machu Pichu in Peru.

Since graduating from NC State, **CHRISTINE NGUYEN HERRICK** has mentored students from the American Society of Civil Engineers (ASCE) student chapter; served as president of the ASCE NC Eastern Branch Younger Member Group; served on the Zia Committee for five years, including three as chair; acted as a judge for senior capstone design projects; and served as a Caldwell Fellow mentor for four years. She also earned a Master of Civil Engineering from Virginia Polytechnic Institute. And that’s just her resume outside of work. Herrick has also worked her way up to become a project manager at Kimley-Horn and Associates.

Founded in 1967 by two NC State alums, Kimley-Horn seemed like the natural fit for Herrick. She first began to intern in 2010 while in school. When she graduated, Herrick continued her career on the structural engineering team at Kimley-Horn and has seen her own career expand and grow. She is experienced in the design of conventional reinforced/ post-tensioned concrete and steel structures, as well as construction consulting. Herrick has a strong background in serving on multi-disciplinary projects requiring high levels of coordination and has worked in several market sectors including transit, aviation, pharmaceutical manufacturing, laboratory, commercial office, private and public development. Close to home, she has been involved with projects like the Wake Technical Community College’s Northern Wake Campus Parking Deck 2, North Carolina State University’s Harrelson Hall Demolition, and the Smith and Sanford Creek Greenway (C-5164) in Wake Forest, NC.

“Kimley-Horn has been, and continues to be, an incredible place of growth and development of its people. I began my career here as an intern while in school and I continue to be challenged and pushed by my colleagues and friends today,” said Christine. She and her husband, **KELLY HERRICK** (BSCE 2011, MSCE 2014), are high school sweethearts who are both structural engineers, though they do work at different firms.

“I’ve been working on a 13-story mixed use structure on Fayetteville Street. It’s next to the ballpark that Kelly, and his firm designed. It’s fun to be able to say that our projects share a mutual foundation.”

**There’s a saying that if you want something done, ask a busy person. Christine Herrick, P.E. (BSCE 2011) falls in that category. In her career, her dedication to volunteer activities, and her extracurricular life, she is tireless.**

### Adventure Awaits in Utah

“We had only been living in our new house for 3 months when this opportunity was offered,” Herrick said. The opportunity was a move to Salt Lake City, to become an emerging practice builder for Kimley-Horn’s new vertical structural engineering group in Utah. “Currently, we have an established Bridge group and Roadway group in Salt Lake City, but we perceived growth opportunities in vertical structural design, and Herrick was a good fit for many reasons,” said Joe Piccirilli, P.E. with Kimley-Horn. “She possesses all the skills necessary to be super successful in our industry. She’s a great technical engineer, detail oriented and organized. She’s a strong leader, and works well with both younger and more senior staff. She easily builds relationships with others, and she’s very active in industry groups. She’s also had a desire to explore locations outside of Raleigh.” “I love this community, and I love my work at NC State with the department, but when I was at the School of Science and Math, we had a motto ‘accept the greater challenge.’ So that’s what I did,” Herrick explained.

Exploring the world is one of Herrick’s and her husband’s passions. The two, who grew up together in Mathews, NC, are avid backpackers, and hiked 42 miles on the Inca Trail for their honeymoon. “I’m extremely excited for the professional opportunity to take more responsibility for identifying and winning new work for the company, and I’m also super excited about the chance to hike more in Utah and the surrounding states,” she said. We wish Herrick all the best in her new endeavors. Her tireless work for the department will be sorely missed, but we look forward to seeing where her new life leads. We are proud of this young alumna and look forward to hearing about her continued journey to “accept the greater challenge.” ■



# CCEE Researchers prominent at Association of Environmental Engineering and Science Professors (AEESP) Conference

Every other year, the Association of Environmental Engineering and Science Professors (AEESP) holds a major meeting for environmental engineering research. Against a desert backdrop, the 17<sup>th</sup> AEESP Conference was held on May 14-16, 2019, in Tempe, Arizona, hosted by Arizona State University in collaboration with the University of Arizona and Northern Arizona University. The CCEE Department from NC State was well-represented this year; 11 students and postdoctoral fellows, in addition to seven faculty, attended and presented research on a wide array of topics.

Dr. **JOEL DUCOSTE**, who serves as the current vice president of the organization, led discussions on the “Grand Challenges” addressed by environmental engineers. (See information on the Environmental Grand Challenges on page 25). Ducoste also facilitated discussions about diversity. While the environmental engineering field has made significant strides in the number of degrees awarded to women, there is still significant underrepresentation in the number of degrees awarded to African Americans, Hispanic/Latinos, Native Americans, and Pacific Islanders. “In a time where the environmental problems facing the world today are complex, we can no longer afford not including all people to help solve these problems,” Ducoste said. AEESP will be leading the charge in developing strategies to correct this shortage in addition to developing a curriculum that better prepares students to solving these grand challenges of environmental engineering.

As a leading scholar on treatment processes for the control of emerging contaminants, Dr. **DETLEF KNAPPE** served as moderator for a full day of presentations on research related to per- and polyfluoroalkyl substances (PFAS) and emerging contaminants. Doctoral student **AMIE MCELROY** spoke about her research using biofilters to degrade 1,4-dioxane. Post doctoral researcher **NADINE KOTLARZ** presented on PFAS exposure through drinking water in Wilmington. Doctoral student **CHUHUI ZHANG** presented advances on the total oxidizable

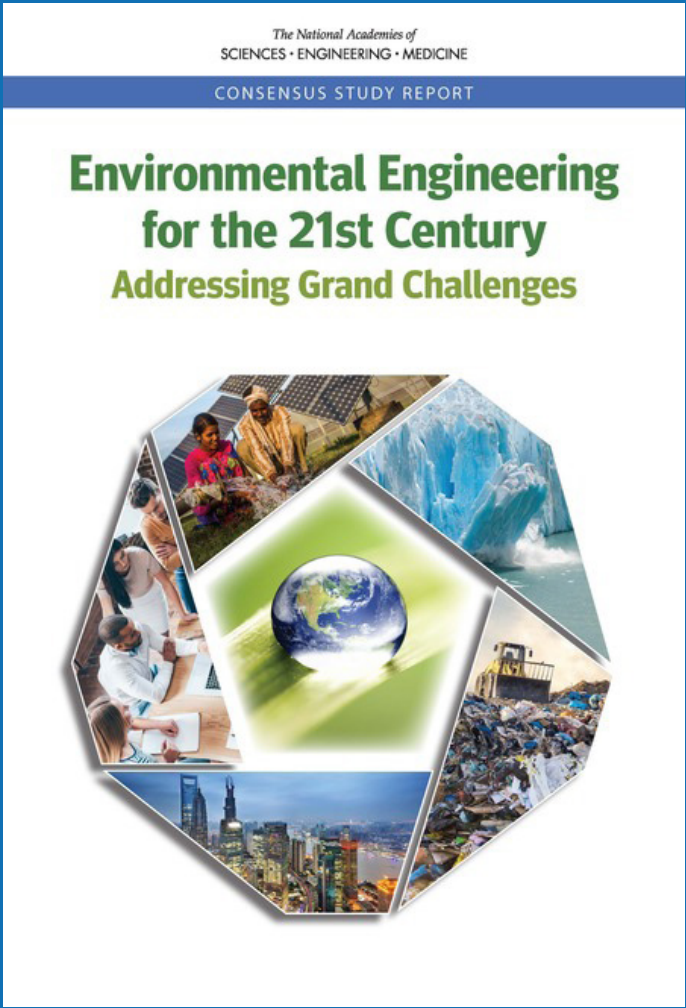
precursor assay, a test designed to uncover the presence of unknown PFAS in environmental samples, and doctoral student **ZACHARY HOPKINS** presented a poster on PFAS removal by granular activated carbon adsorption. Also related to water treatment, Dr. **DOUG CALL** talked about new contaminant degradation pathways in biological activated carbon systems. Post doctoral researcher **SHAN ZHU**, who is advised by Call, discussed electrosorption. Their research is exploring how using electrically-active filtration systems may enable better removal of PFAS from drinking water.

NC State’s Global Water, Sanitation, and Health faculty cluster showcased their work combatting global sanitation issues and spreading access to safe drinking water. Dr. **FRANCIS DE LOS REYES, III** discussed mechanized methods to empty pit latrines, while Dr. **ANGELA HARRIS** discussed methods for source (i.e., animal host) identification of fecal contamination detected in the environment that can be used in low-income country contexts. Dr. **JOSHUA KEARNS** presented a poster on using cow bone charcoal as a low-cost adsorbent for removing excess fluoride from drinking water in rural communities in Mexico. Kearns was also invited to join the AEESP publishing committee and will be assisting curation of content for Special Issues of the AEESP journal *Environmental Engineering Science*.

NC State research on energy and sustainability played prominently at the conference. Master’s student **JOSEPH HOLLINGSWORTH** presented research on the life cycle environmental impacts of shared dockless electric scooters, while doctoral student **QIAN LUO** showcased a novel method to reduce adverse human health impacts from air pollution using grid-scale energy storage. Dr. **JEREMIAH JOHNSON** presented a study that quantified the potential for emissions reductions by altering patterns of residential electricity consumption. ■



CCEE professors and students at the 17<sup>th</sup> AEESP Conference.

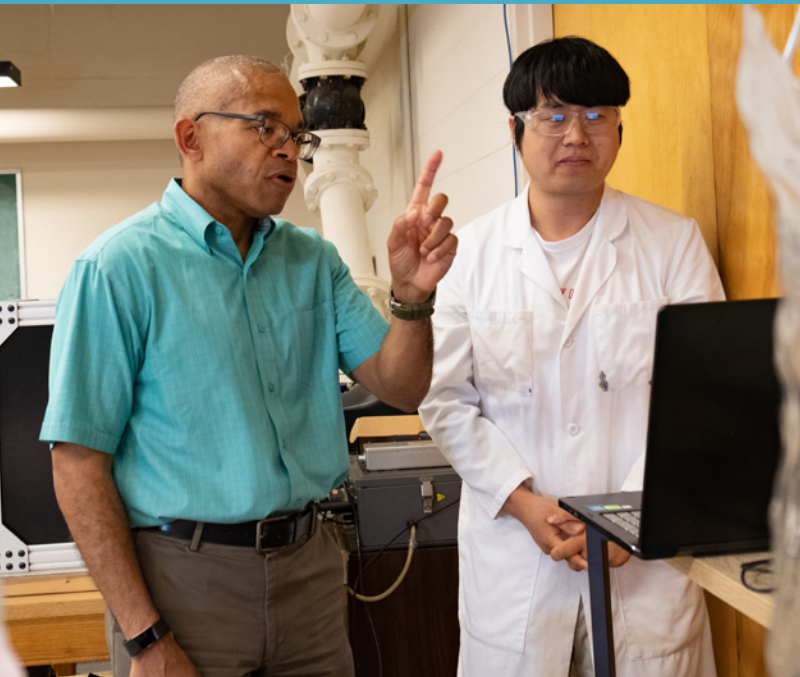


Environmental Engineering for the 21<sup>st</sup> Century: Addressing Grand Challenges outlines the crucial role for environmental engineers in this period of dramatic growth and change. The study was authored by 18 of the nation's leading environmental engineers, scientists, and policy experts under the auspices of the National Academies of Sciences, Engineering, and Medicine. Modeled on the National Academy of Engineers (NAE) Grand Challenges for Engineering, which was released in 2008, the report outlines the crucial role for environmental engineers in developing strategies and technologies to provide for the well-being of society. The report identifies five pressing challenges for the 21<sup>st</sup> century that environmental engineers are uniquely poised to help advance:

1. **Sustainably supply food, water, and energy**
2. **Curb climate change and adapt to its impacts**
3. **Design a future without pollution and waste**
4. **Create efficient, healthy, resilient cities**
5. **Foster informed decisions and actions**



How your support makes a difference



Dr. Joel Ducoste (left) and Ph.D. student Zisu Hao review temperature data from a pilot scale experiment investigating the effects of non-biological reactions on the generation of heat in landfills.



The student chapter of Coasts, Oceans, Ports and Rivers at the Coastal Studies Institute during an annual field trip to the Outer Banks.

ENDOWED FACULTY SUPPORT

Faculty are the heart and soul of the Civil, Construction, and Environmental Engineering Department, which is home to more than 50 dedicated scholars and educators. Endowments and named professorships are an essential part of our effort to recruit and retain the very best faculty and then provide them with opportunities to explore new research ideas with the involvement of graduate and undergraduate research assistants. Relative to our peer institutions, the department has a low number of endowed professorships.

ENDOWED GRADUATE FELLOWSHIPS

We strive to attract the best and brightest graduate students from the U.S. and around the world. Departmental rankings, faculty recruitment, research success, and undergraduate education all depend on the presence of talented graduate students. Competition for the best graduate students is intense, and finances can be a deciding factor for students when choosing a graduate program. To recruit the best students, and to create a vibrant learning environment for undergraduate students, CCEE must be able to recruit students and provide competitive graduate fellowships.

ENDOWED UNDERGRADUATE SCHOLARSHIPS

Undergraduate scholarships enable us to prepare tomorrow’s leaders in civil, construction, and environmental engineering. Students are drawn to NC State and CCEE by our reputation for excellence. Cost is a major consideration for students and their families. Scholarships represent a mechanism to support and reward our top students.

CCEE ENHANCEMENT FUND

An annual gift to the CCEE Enhancement Fund makes it possible to provide students the best possible education and extracurricular experiences. The enhancement fund allows us to respond to emerging needs and exciting challenges. For example, last year we deployed teams of students to the field for data collection as soon as it was safe after Hurricane Florence hit North Carolina. Your support enables recruitment and retention of the best and brightest faculty and students, support for our student organizations, field trips to complement classroom instruction, and opportunities for faculty and students to present at conferences. Our enhancement fund is critical to the department as we strive to continue to provide opportunities for students and faculty.

RECOGNIZING OUR CORPORATE SPONSORS

Our corporate sponsors may opt to provide support for specific research areas, enabling faculty to pursue a new research idea. Sponsorships are also available for this newsletter, the welcome back ice cream each fall and our graduate symposia. The symposia allows students to prepare a poster to describe their research and make a presentation to the local engineering community. The activities of our student groups (see page 20) are also dependent on external financial support.

The *Firm of the Month* program recognizes corporate partners who have made an ongoing commitment to the

department. It allows us to thank and promote our partners while educating our students about current engineering practice. Firms prepare a series of slides for our monitor in the lobby and also display posters throughout Mann Hall to highlight notable projects. Firm of the Month provides participating firms with name recognition for recruiting and business opportunities, demonstrates to students the ways that they can use their degrees after graduation and provides information on employment opportunities. Our most recent Firms of the Month include Fluor and Dewberry. ■



The department has a wide variety of programs that are made possible by private financial support. For more information on opportunities to help, please contact **Lindsay Smith**, our Director of Development at [lksmith4@ncsu.edu](mailto:lksmith4@ncsu.edu) or **919.515.7738**.

2019 Corporate Donors

The firms listed here have provided endowments or made contributions from January 1, 2019 through mid August 2019. Many on the list have supported multiple activities in the department. The department would like to extend our sincere thanks.

ACI Carolina’s Chapter	ECS Southeast, LLP	Jarco Supply, LLC	S&ME
Aggregate Group, LLC	Environmental Research and Education Foundation	Kimley-Horn & Associates, Inc.	Sanford Contractors, Inc.
Alera Group, Inc. TriSure Operating	EOS Remediation, LLC	Lysaght & Associates	SCS Engineers
Alpha & Omega Group	Fluor Enterprises, Inc.	MBP	SEPI Engineering & Construction
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Boeing Company	Holder Construction Company	MI Engineering, PLLC	Structural Engineers Association
Brasfield & Gorie	IBM	North Carolina Department of Transportation	Thomas Concrete of North Carolina
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Clancy & Theys Construction	Infratech Engineers and Innovators, LLC	Owle Construction	Vand Solutions, LLC
CMAA North Carolina Chapter	IQ Contracting, LLC	Pope Custom Homes, Inc.	Vaughn & Melton Consulting Engineers
Delta Oaks Group	J.E. Dunn Construction Company	Poyner Spruill, LLP	Wetherill Engineering, Inc.
Dewberry	James R. McAdams Company	Rehab Builders	WithersRavenel, Inc.
DPR Construction			
Duke Energy			



“Be a good human.”

LEE DINGLE



Lee Dingle

## CCEE Alumnus Lee Dingle Memorial

born leader and problem solver, he relished the engineering challenges of designing solutions for tough design problems in existing structures. His characteristic calm and smiling approach to the toughest challenges made him an inspiring leader.

He also served as a volunteer structural engineer with the North Carolina Emergency Management Urban Search and Rescue (USAR) task force where he provided engineering technical assistance to firefighters when entering damaged and collapsed buildings. He played a vital role in helping first responders safely enter the collapsed building at the Con-Agra explosion during the recovery operations, along with several other USAR deployments in the state.

The faith-filled, loving husband and father of six, including three adopted from Uganda, one adopted from Taiwan and two birth children, will be sorely missed by family, friends and colleagues. For those wishing to help his family in their time of need, a GoFundMe account has been setup to assist them: [gofundme.com/f/love-for-the-dingle-family](https://gofundme.com/f/love-for-the-dingle-family). ■

President of Atlas Engineering and NC State civil engineering alumnus **Lee Dingle** was tragically killed on July 19, 2019 in an accident while on vacation with his family. Dingle graduated from CCEE in 2004 and earned the General Hugh Shelton Undergraduate Leadership Award of Excellence. He joined Atlas Engineering immediately after college where his leadership and engineering skills allowed him to prosper.

Dingle was an engineer with Atlas Engineering for 15 years and recently unanimously elected president of the firm. A natural-

## Share Your News

There are thousands of alumni of the Civil, Construction, and Environmental Engineering Department working throughout the nation, and around the globe. We invite you to provide us with updates about career accomplishments, awards or recognition, as well as retirements. We aspire to create a community of alumni that remain connected to the department and to each other. We also want to keep your contact info current so we can keep you up to date on department events. Send your information to Julie Dixon at [jwdixon2@ncsu.edu](mailto:jwdixon2@ncsu.edu).

**Name, Mailing and Email Address**  
**Company Name and Address**  
**Degree, Major and Class Year**  
**Announcements**

Also, we invite you to connect with us on social media to keep up with the latest news.



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## ALUMNI BRIEFS

Dr. **REFAAT A. ABDEL-MALEK**, P.E., F. ASCE (Ph.D. 1972) is vice chairman of MWN Global, Inc. in Chicago, overseeing all of its business, engineering, and administrative operations. After a short stint on the faculty at the Illinois Institute of Technology, he joined Harza Engineering in Chicago, ultimately becoming chairman and CEO. Abdel-Malek has more than 40 years of experience in the overall management, planning and designing projects for water, power, and land resources development in the United States and overseas. He was elected the president of the International Hydropower Association in 2007. As an expert on hydropower and sustainable development, he is regularly invited as a keynote speaker in conferences around the world.

**SHOMA CHAKRAVARTY** (MSCE 1998) is vice president of Enterprise Architecture at Verizon. Her team is responsible for designing the architectural blueprint for software systems across Verizon's many business units, defining technology strategy, and establishing design patterns for scale and reuse. At NC State she specialized in computer-aided engineering (now computing and systems), a program in CCEE that gave her the foundation and paved the way for her 20+ year career in software engineering. Prior to joining Verizon, she was a technical leader at Amazon Web Services, the CTO of start-up Telarix, and a chief software architect at IBM.

**JOHN FISHBURNE**, P.E. (BSCE 1990) joined Freese and Nichols in its Charlotte office and will help the firm grow its water / wastewater services in North Carolina and beyond. Before joining Freese and Nichols, Fishburne spent 13 years with Charlotte Water, where he served on the leadership team for the Field Operations Division. He handled high-priority field operations, worked with infrastructure owners, other city departments and environmental regulators, and led the Critical Asset Team. Fishburne has almost two decades of experience working for both the city and his own firm in managing a variety of pipeline rehabilitation and replacement projects.

**SERENA H. GILLES**, P.E. (BSCE 2006, MSCE 2008) relocated to Madison, WI, last year and began working for Pierce Engineers, a structural engineering consulting firm specializing in low- and mid-rise residential, educational, and mixed-use building design. Her interests include lateral wood and steel design, precast podium design, and concrete repair. She is a licensed professional engineer in Wisconsin, Oregon, and Washington.

**JENNIFER GISSENDANNER**, P.E. (MSCE 2001) is now an environmental project manager with Thomas & Hutton. She will focus on the expansion of natural gas efforts throughout the southeastern United States. She brings over 19 years of project management and multi-disciplinary engineering experience to this position including managing major gas and energy projects. Gissendanner lives in Cayce, South Carolina, with her husband and two sons.

Dr. **IDRIS JEELANI** (MSCE 2016, Ph.D. 2019) joined the University of Florida as an assistant professor of the M.E. Rinker, Sr. School of Construction Management. His research focuses on examining issues related to poor safety performance in construction, and developing artificial intelligence-based solutions to support building the next generation of safe and smart infrastructure. His research has been published in the *ASCE Journal of Construction Engineering and Management*, where he received the Best Paper Award in 2017, and in *Automation in Construction*.

**WILL LETCHWORTH**, P.E. (BSCE 2002, MS 2004) was recently named Carolinas area manager for WSP U.S.A., Inc., a leading engineering and professional services consultancy. Letchworth, who had been serving as WSP's Raleigh Office Lead, will be responsible for business development and growth, project delivery, staff engagement, and financial performance in North and South Carolina. He is active and has leadership roles in a variety of civic and professional organizations, including the Johnston County Planning Board. He is an administrative deacon at Zebulon Baptist Church and resides with his wife April and daughters Lainey and Ava in Johnston County, NC.

Dr. **NEHEMIAH J. MABRY**, P.E. (Ph.D. 2015) was the invited Keynote Speaker at the 2019 New York Statewide Science & Technology Entry Program Conference in Albany, NY. He regularly engages in STEM outreach and public speaking through his company STEMedia. As a result of this work, which he began as a student at NC State, he will be accepting one of his former high school's most prestigious alumni awards, the 2019 Community Impact Award, this fall in Huntsville, AL. He currently works as a Bridge Design Engineer at Simpson Engineers & Associates in Cary, NC, and serves as part-time lecturer in the NC State CCEE Department.

**MOSTAFA NAMIAN** (Ph.D. 2017) recently joined the Department of Construction Management at East Carolina University as an assistant professor. He is responsible for teaching undergraduate and graduate courses and conducting research in construction management. His current research focuses on construction safety enhancement. He is also an OSHA-authorized safety trainer.

**NORMAN SAMET** (BSCE 1959) was recently awarded the first ever Legacy Award in Commercial Real Estate by the Triad Business Journal (TBJ). Samet is founder and chairman of Samet Corp., a general contractor and developer based in Greensboro, NC, with offices in Charlotte, Raleigh, and Charleston, SC. In presenting the award, TBJ applauded Samet's vision and leadership in the region — he has chaired the Greensboro and High Point chambers of commerce and the Piedmont Triad Partnership, and served on the N.C. Economic Development Board, the Greensboro Development Corp., and the Action Greensboro Core Committee. ■





# Fitts-Woolard Hall: Supported and constructed by alums for the next generation

- Aggregate Processing Lab
- Air Quality Lab
- Asphalt Mixing Lab
- Asphalt Multi-Scale Testing Lab
- Materials Conditioning Lab
- Cementitious Materials Research Lab
- Civil Computer Software Teaching Lab
- Civil Engineering Systems Lab
- Coastal Engineering Lab
- Concrete Technology Lab
- Construction Engineering Lab
- Construction Computing Lab
- CCEE Student Projects Lab
- Driving Simulator Room
- Incubator Research Lab
- Hydraulics Teaching Lab
- Hydraulics Research and Flume Lab
- Soils Lab
- Structural Composites Lab
- Structural Behavior Measurements
- Structural Testing Lab
- Transportation Control and Sensors Lab
- Environmental Analytical Instrumentation
- Environmental Engineering Teaching Lab
- Environmental Engineering Pilor Lab
- Molecular Biology Lab
- Global Sanitation Lab
- Electrochemistry Lab

*“Between a recently completed tour, and meetings on furniture selection and move logistics, our new home is becoming much more than a set of construction drawings. I am very excited for the way that this building will serve engineering students for decades to come.”*

Dr. Morton Barlaz, CCEE Department Head



There are naming opportunities still available, including many of the Laboratories listed here. Contact Erica Fuller with the NC State Engineering Foundation at [eacinder@ncsu.edu](mailto:eacinder@ncsu.edu) or 919.515.9958.

## Department Advisory Board

The following distinguished alumni and friends of the department currently serve on the board:

<b>Jennifer Brandenburg</b> BSCEC 1986 Volkert	<b>John Lucey</b> McKim & Creed	<b>Alan L. Stone</b> BSCE 1987, MSCE 1989 Hazen and Sawyer
<b>Heather Denny, Past Chair</b> BSCEC 1995 Wells Global	<b>Tonya Mills</b> BSCE/BSENE 1994 Tri Properties, Inc.	<b>Gray Talley, Secretary</b> BSCEC 1998 Shelco Inc.
<b>Christine Herrick</b> BSCE 2011 Kimley-Horn & Associates	<b>Mike Munn</b> BSCEC 1995 The John R. McAdams Company	<b>Steve Thomas</b> BSCE 1984, MSCE 1986 Sepi Engineering
<b>Joe Hines</b> BSCE 1991 Timmons Engineers	<b>Dan Pleasant</b> BSCE 1972, MCE 1973 Dewberry	<b>Hans G. Warren, Jr.</b> BSCEC 1984 Warco Construction, Inc.
<b>Jonathan Holtvedt</b> BSCE 2015, MCE 2017 Balfour Beatty	<b>Bill Pope, Vice Chair / Nominating Chair</b> BSCEC 1983 Pope Custom Homes	<b>Mike Wayts</b> Freese and Nichols, Inc.
<b>Tyler Highfill</b> BSCE 1992, MSCE 1994 Highfill Infrastructure Engineering, P.C.	<b>Stacey Smith, Chair</b> BSCEC 1992, MCE 2004 Smith Gardner, Inc.	
<b>Glenda Gibson</b> BSCE 1987 Mott McDonald	<b>Sandra Stepney</b> BSCE 1983 Simpson Engineers & Associates	

## Investing in the Department

We invite you to invest in the future of the department. Your gift will help us take CCEE to a new level of excellence.

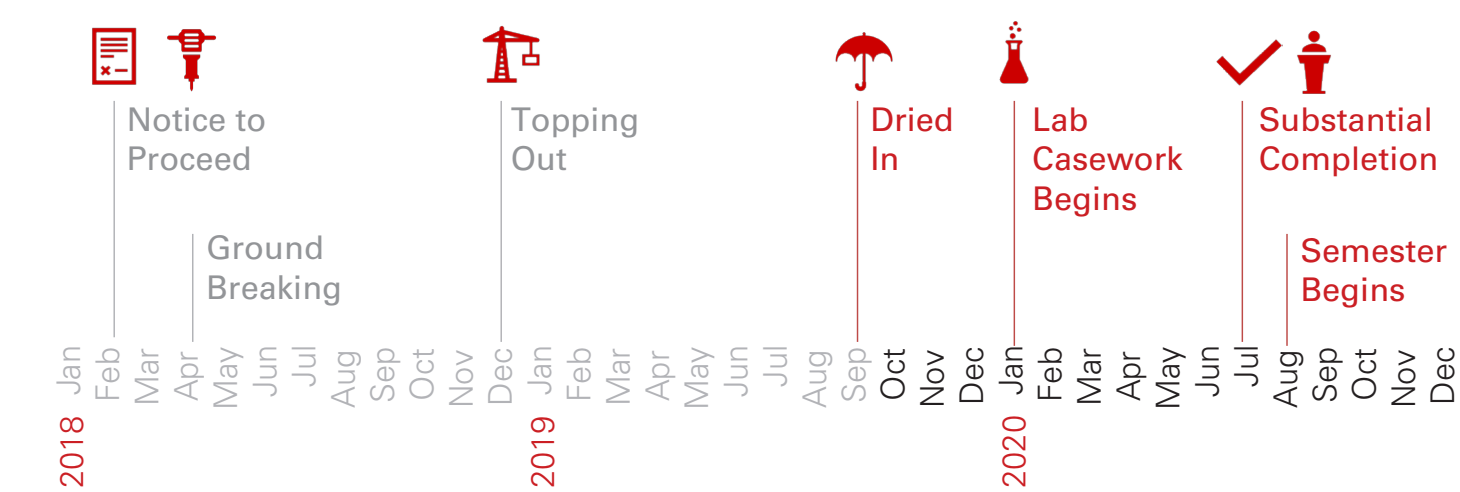
You can choose an annual gift, an endowed gift, or a one-time gift. Outright gifts of cash can be made by simply writing a check payable to:

**NC State Engineering Foundation**  
**Campus Box 7901**  
**Raleigh, NC 27695-7901**

Please indicate on the check, or with a note, the purpose of your gift and that it is directed to CCEE.

If you prefer to make your donation online, you can use your credit card with our online feature at [www.engr.ncsu.edu/alumni-and-giving/ways-to-give](http://www.engr.ncsu.edu/alumni-and-giving/ways-to-give). Drop down menus will allow you the chance to specify that you want your gift to be directed to our department or to the Fitts-Woolard Hall Building Project Fund.

For more information contact:  
**Lindsay Smith**, CCEE Director of Development  
Phone: **919.515.7738**  
Email: [lksmith4@ncsu.edu](mailto:lksmith4@ncsu.edu)





## ENGINEERING ONLINE COURSE OFFERINGS FOR SPRING 2020

- Advanced Theory of Concrete Structures
- Advanced Traffic Control
- Analysis and Design of Masonry Structures
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- Finite Element Methods in Structural Engineering
- Foundation Engineering
- Highway Design
- Introduction to Numerical Methods
- Legal Aspects of Contracting
- Materials Management in Construction
- Physical and Chemical Water Treatment Processes
- Properties of Concrete and Advanced Cement-Based Composites
- Physical Principles of Environmental Engineering
- Principles of Air Quality Engineering
- Special Topics in Construction Engineering
- Special Topics in Geotechnical Engineering
- Structural Design in Wood
- Structural Dynamics

### Master of Civil Engineering (MCE)

*concentrations*

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CONSTRUCTION  
COMPUTING AND SYSTEMS  
GEOTECHNICAL  
STRUCTURES AND MECHANICS  
TRANSPORTATION MATERIALS  
TRANSPORTATION SYSTEMS  
WATER RESOURCES

### Master of Environmental Engineering (MENE)

*concentrations*

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# ENGINEERING ONLINE

NC State has been offering distance education in engineering for more than four decades, and is consistently ranked among the top online engineering programs in the country. Our CCEE Department offers two degrees, Master of Civil Engineering (MCE), and Master of Environmental Engineering (MENE). In 2018 rankings by Best College reviews our online Environmental Engineering degree was ranked #1 in the country, and our Civil Engineering degree earned the #2 spot! With numerous courses available each semester, our online students are able to customize their degrees to support their area of professional interest. The online degree requires the completion of 10 courses, which some students complete in as little as two years, though three to four years is more typical given their other responsibilities.

Go to the Engineering Online Registration Portal at  
[www.engineeringonline.ncsu.edu/apply-and-enroll/enroll](http://www.engineeringonline.ncsu.edu/apply-and-enroll/enroll).



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nc state civil construction and  
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