



THE UNIVERSITY OF TENNESSEE CHATTANOOGA

# COLLEGE OF ENGINEERING & COMPUTER SCIENCE

2015-2016  
*Year in Review*

[www.utc.edu/CECS](http://www.utc.edu/CECS)

**VISION**

To be a preeminent college of engineering, engineering management, technology, and computer science in education and applied research.

**MISSION**

- 1) Educate and train future technical & engineering management workforce for Tennessee, the nation, and beyond.
- 2) Discover new knowledge in engineering, management, technology and computer science.
- 3) Engage communities through scholarship, service and economic development.

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**Message from the Dean**



It was in the fall of 1969, soon after the University put on its new name as the University of Tennessee at Chattanooga, that a new engineering program was envisioned. Four gentlemen, Drs. Lynn Russell, Terry Carney, Bob Wynn, and Ron Cox, with the support of community leaders and elected officials, established a Division of Engineering, built upon the foundation of the predecessor University of Chattanooga Engineering Program. The four men had a vision and energy to develop an engineering curriculum and academic concentrations which later became a department, and then a college, to produce the technical workforce and engineering leaders needed in the region. With an initial primary focus in the industrial manufacturing sector, the program was then, and is still, a strong economic driver in the Tennessee Valley Corridor. The program started with five faculty and forty students. The engineering department became a college with computer science joining its force in the early 1980's.

Over the past 47 years, the College produced over 5000 engineers, engineering managers, computer scientists, and technologists. This fall, we welcomed 392 new students and welcomed back 1,046 in 13

different programs. Students from 22 different states and 12 countries make up our current student population of 1438. The people who founded the program and built upon its foundation during the ensuing years would be very proud of where the College is today.

As we build upon our tradition, we are embarking on a new venture of communicating to our students, alumni, constituents, and friends through an annual review report. In this first edition, we present the proud accomplishments of our students, staff, and faculty in the College from the past academic year. You will be surprised to see the number of scholarship, civic, and service activities in which our students, staff, and faculty are involved. You will be delighted to read about the discoveries our students and faculty are making in their particular disciplines.

The College is continuing to move ahead with its future in mind. The faculty recently adopted a new strategic plan to enrich student experience, to incorporate and encourage applied research opportunities for our students and faculty, and to engage in scholarly and community activities. Since the early beginnings of the engineering program in 1969, you will find that we have grown much in almost all areas of what we do, including the number of programs we offer, student enrollment, the strength of our faculty expertise, and the support personnel for student success. With all the growth we experienced, though, our aim has not changed over the past 47 years: producing outstanding future workforce and leaders of our region, state, nation, and beyond, through excellence in teaching, research, and service.

With a grateful heart,

Educating and training the next generation of engineers, engineering managers, technologists, and computer scientists is the first component of the College's threefold mission. Preparing students to take on the challenges of the 21st century, and to envision and deliver solutions to real-world problems, drives our faculty to think anew about both what we teach and how we teach it.

We, as a society, increasingly encounter problems that call for solutions beyond any one discipline's boundaries. Many of the most important innovative opportunities demand research, teamwork, and integrated educational expertise across many technical areas. Building upon the heritage of teaching excellence, our faculty and students explore expected knowledge and skills for engineers, engineering managers, technologists, and computer scientists of the future, and continue to prepare them in a variety of ways.

From student accomplishments on state and national levels, to participation in engineering and design competitions, to the induction of our largest class of the Order of the Engineer, 2015-16 was a year filled with educational challenges and accomplishments for CECS. The information which follows will give you an overview of how those educational challenges and accomplishments expanded students' preparation for understanding the implications of real-world problems, and for finding their solutions.

**Competitions**

During 2015-16, students from each of the engineering and computer science disciplines participated in a variety of competitions showcasing their applied knowledge and talents. The awards earned by the student groups at these important regional and national competitions brought recognition to CECS.

**Society of Automotive Engineers (SAE) Collegiate Design Competition**

Extreme Engineering is what **Society of Automotive Engineers (SAE) Collegiate Design Competition** is all about: going beyond textbook theory by designing, building and testing the performance of a real vehicle. For the 10th year, CECS participated in the Baja SAE competition with a team of 22 students from Civil, Electrical, Industrial, and Mechanical Engineering. Traveling to Gorman, California, the team's efforts were part of an interdisciplinary design course, and were supported by generous gifts from the Volkswagen Group and DENSO.



*Brake Test: The brake test is the final part of passing technical inspections. In this test the car must come up to maximum speed and lock all four tires, proving functional braking systems on front and rear.*



Left to right: Stephen Frey, Rube Goldberg's granddaughter (Jennifer George), Matt Rigelsky (back), Shaye Thompson, Richard Cook, Andrew Mowrer, and Eric Williams.

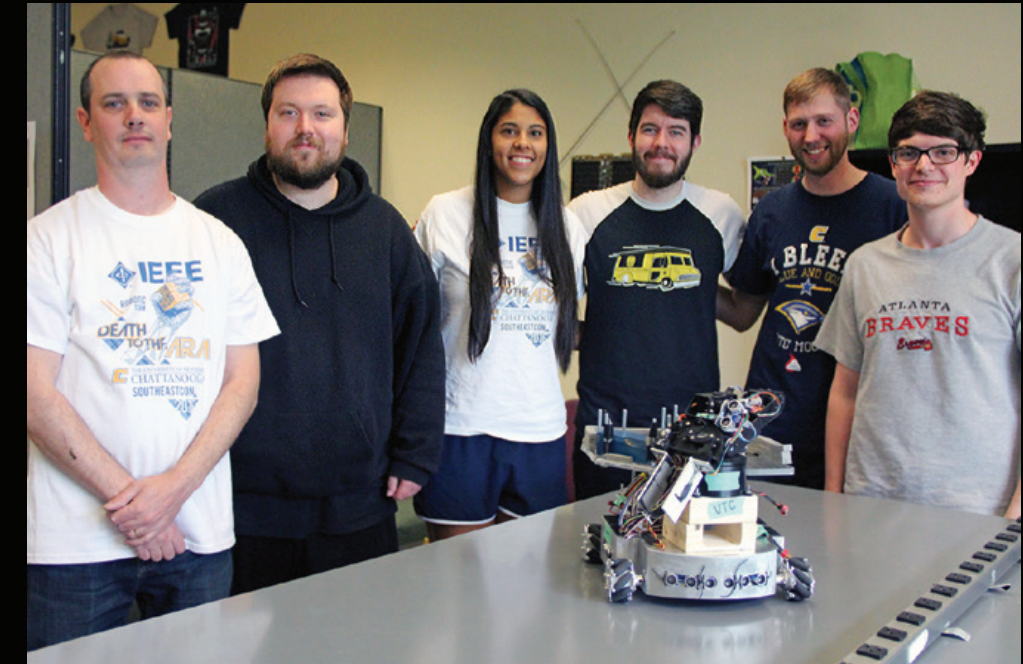
### AiChE Southern Regional Student Conference



Nisarg Hansaliya demonstrating the Chem-E-Car.

The **Chem-E-Car Team** recently won 1st place in the Poster Competition at the American Institute of Chemical Engineers' 2016 Southern Regional Student Conference.

### IEEE SoutheastCon 2016



Left to right: Brian Rollins, Josh Chapman, Julimar Alvarado, David Hoskins, Carter Allen, and Nicholas Pippenger.

This April, the **Senior Design IEEE Robotics Team** participated in SoutheastCon 2016 in Norfolk, VA, placing 12th out of 46 teams in the hardware competition. The UTC team bested teams from Georgia Tech, the Citadel, and the University of Central Florida.

### National Rube Goldberg Competition

Congratulations to our **American Society of Mechanical Engineers Student Chapter** for winning the "Best Single Step" at the National Rube Goldberg Institute (RGI) Competition in Columbus Ohio. The CECS team is pictured here with Jennifer George, granddaughter of the late Rube Goldberg, Pulitzer Prize winning cartoonist for whom the competition is named. RGI promotes STEM education, invention, and imagination for students of all ages.

### Computational Engineering PhD Candidates Accepted into Argonne Training Program on Extreme-Scale Computing

Weiyang (Ryan) Lin and Ethan Hereth, both PhD Candidates in Computational Science: Computational Engineering at UTC, were accepted into the **Argonne Training Program on Extreme-Scale Computing (ATPESC)** for 2016.

With around 65 participants accepted each year, admission to the ATPESC program is highly competitive. In 2015, Computational Engineering PhD Candidate Chao Liu was accepted and gained invaluable knowledge from the experience.

The program provides intensive, two-week training on the key skills, approaches, and tools to design, implement, and execute computational science and engineering applications on latest high-end computing systems. Participants also learn the leadership-class computing systems of the future.

As a bridge to that future, this two-week program fills the gap that exists in the training of computational scientists through formal education or other shorter courses. ATPESC is funded by the U.S. Department of Energy's Office of Science.



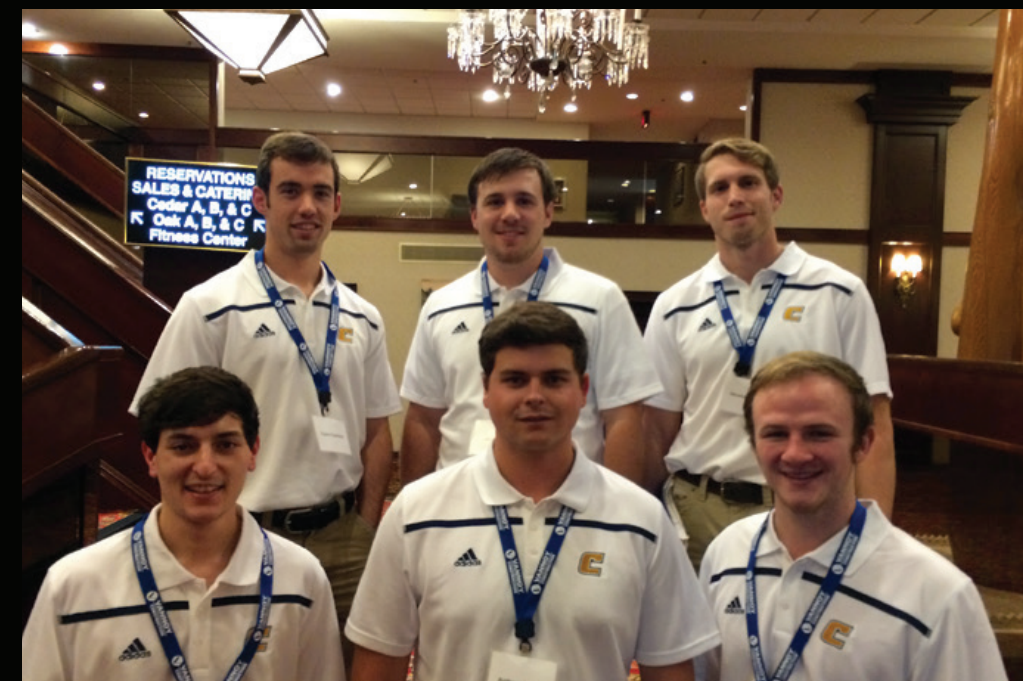
Ethan Hereth



Weiyang (Ryan) Lin

### Associated Schools in Construction (ASC) Region 2 Student Competition

The **Construction Management Competition Team** representing the Engineering Management & Technology Department traveled to Greensboro, NC, for the Associated Schools in Construction (ASC) Region 2 Student Competition in October. The team competed in a two day competition against other universities including University of Florida, Virginia Tech, Auburn University, Clemson University, UNC Charlotte, Mississippi State University, and Appalachian State University. Each team was given a project they had never seen before, involving constructing a 12-story office building sitting on top of a 6-story parking garage, totaling over 240,000 square feet. Teams had 12 hours to prepare an estimate, a formal proposal, a project schedule, a safety plan, a logistics plan, a building information model (BIM), and a 20 minute presentation.



Front l-r: Dominic Nanni, Anthony Preskitt, Campbell Lewis. Back l-r: Taylor Copeland, Jordan Pitt, Houston Kowing.

## Scholarships and Honors

Generous gifts from corporations, professional societies, and individuals have established seventeen scholarships for CECS students awarded by the College's Scholarship Committee. During 2015-16, engineering and computer science students received over \$170,000 in CECS-designated merit scholarship awards.

The bi-annual **Order of the Engineer Ceremony** was held Monday, April 18, 2016 with the largest group of inductees in the history of the college.

Congratulations to the 41 student inductees. Dr. Bradley J. Harris, Assistant Professor, Chemical Engineering and Dr. Daniel J. Pack, Dean, College of Engineering and Computer Science were also inducted.

Induction into the Order is offered to all those graduating with degrees in engineering. The ceremony is held prior to the University's commencement exercises, and focuses on affirmation of professionalism and ethics in engineering.

Seth Bishop, Mechanical and Industrial Engineering double major, and Baja SAE Team member, was named the 2016 recipient of a GEICO scholarship from Tau Beta Pi Engineering Honor Society. **Tau Beta Pi Scholarships** are awarded to students on a competitive basis for high scholarship, campus leadership and service, and the promise of future contributions to the engineering profession.

Tau Beta Pi is the world's largest engineering society. Membership represents the highest honor to be obtained by an engineering student, and is awarded on the basis of high scholarship and exemplary character.



Seth Bishop

In September 2015, UTC College of Engineering and Computer Science Civil Engineering senior Bethany Griffin was selected by the Tennessee Section of the American Society of Civil Engineers (ASCE) as **2015 recipient of the Student Chapter Member Award**. The award recognized Bethany as the State's most outstanding undergraduate civil engineering student. At the annual Tennessee Engineers' Conference in Murfreesboro, Bethany was honored by the Society following her nomination by its Chattanooga Branch.

Bethany Griffin, pictured here assembling a bridge with her team in the Steel Bridge competition at the American Society of Civil Engineers Southeast Student Conference in 2015 hosted by the University of Tennessee at Chattanooga.



Pictured left to right: Dr. Daniel Pack, Kasey Content, Ashley Thompson, Natalie Burdine, Grace McPherson, Gabrielle Norton, Sharhea Bell, Caroline Meacham, and Dr. Jerald Ainsworth.

Over one hundred of the College's students, faculty, and staff joined CECS Advisory Board Chairman and EPB Board Chairman, Mr. Joe Ferguson, UTC Provost and Senior Vice Chancellor for Academic Affairs, Dr. Jerald Ainsworth, and Dean Daniel Pack in celebrating an evening recognizing student and faculty scholarship and service. Held on April 20th, the **CECS Awards Dinner** highlighted the outstanding work of students, staff, and faculty in the areas of academic excellence, research, and community outreach. The event featured opening comments by Mr. Ferguson, reflections on their experiences in the College by graduating seniors Amanda Wade and Abbas Shahid, and congratulatory remarks by Dean Pack and the College Department Heads.

Merit Scholarship awards for 2016-17 totaling over \$100,000 were announced that evening, including the first recipients of scholarships sponsored by Volkswagen Group.



**Computer Science student Jackson Stone** was named by the Oak Ridge Institute for Science and Education (ORISE) as recipient of a Project Spotlight Award. Jackson's research modeling data relative to HVAC efficiency involved virtualizing structures and the development of other engaging aids facilitating scientific interpretation.

Jackson Stone pictured left.



Rube Goldberg machine demonstration by senior Andrew Mowrer

## CECS Showcased Research and Designs, Spring 2016

In April, fifteen of the College's students and faculty shared their research and design projects at the University-wide Research Dialogues. The two day event featured traditional poster presentations, research symposiums, and two inaugural activities – a 3 Minute Thesis Competition for Master's and PhD students, and a Faculty Elevator Pitch Competition. Two CECS members won those competitions:

- 3 Minute Thesis Competition – effective explanation of the student's thesis to an audience unfamiliar with the subject – top prize was won by Computational Engineering PhD candidate Jhiin Joo.
- Faculty Elevator Pitch Competition – presentation of research in a limited timeframe and “layman” language. The STEM topic prize of a \$1,500 mini-research grant was won by Dr. Daniel Loveless, Electrical Engineering Assistant Professor.

The 11th annual CECS Research and Design Showcase, coordinated by Mechanical Engineering Professor Cecelia Wigal, provided an opportunity to share with the campus the research efforts of students in every major in the College. The student posters and displays of thirty-one student design teams provided an effective platform showcasing applied research initiatives ranging from adaptive devices to improve the lives of those with physical challenges to the SAE mini-baja vehicle.

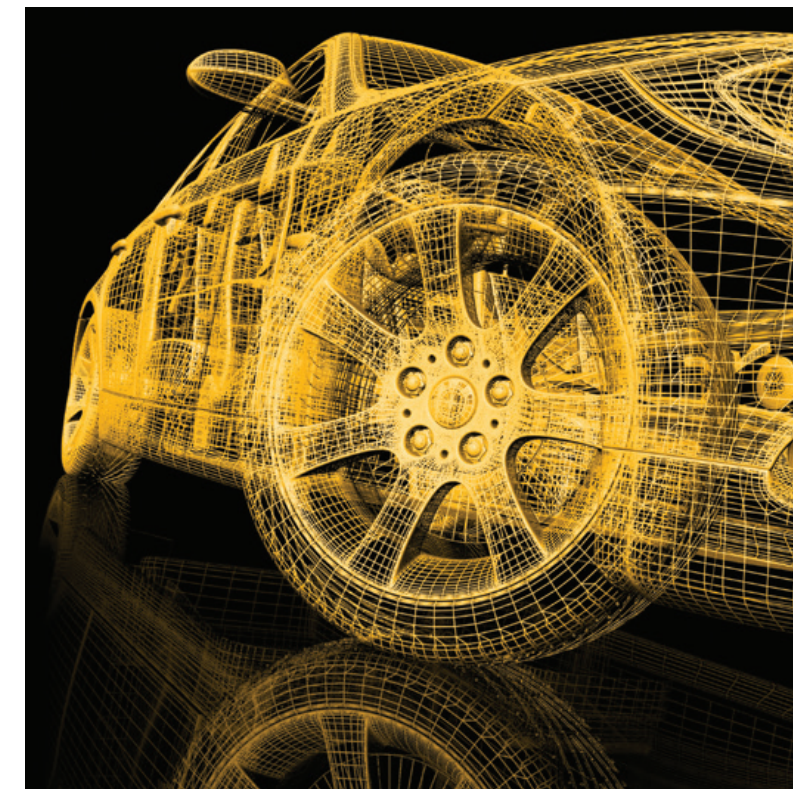
## Meet the Dean: Dr. Daniel J. Pack

A renowned expert in robotics, computer vision, engineering education, and unmanned systems, Dr. Daniel Pack was named as Dean of the College of Engineering and Computer Science at the University of Tennessee at Chattanooga in November 2015. Pack previously served as Mary Lou Clarke Professor and Chair in Electrical and Computer Engineering at the University of Texas at San Antonio (UTSA).

At UTSA, Pack led a department of 32 faculty members with 850 students and managed a \$6 million budget plus a research enterprise of more than \$3 million annually. Prior to joining UTSA, Pack held faculty positions at the U.S. Air Force Academy. In 2005, he was named the Colorado Professor of the Year by the Carnegie Foundation.

Pack holds a Ph.D. in electrical engineering from Purdue University. His dissertation examined sensor-based control for a quadruped walking robot. He earned a master's degree from Harvard University and a bachelor's degree from Arizona State University.

His ongoing research interests include unmanned aerial vehicles, intelligent control, automatic target recognition, robotics, and engineering education.



## Master of Science in Engineering: Automotive Systems Fall 2016

Enrollment in the new MS Engineering: Automotive Systems Program started in Fall 2016. Developed in response to the needs of the College's automotive partners in the region, the curriculum addresses the changing demands of the industry for advanced engineering, design, and manufacturing. Unique features of the degree include: emphasis on advanced manufacturing, a systems approach to design, advanced simulation, and project management. Four groups of courses allow students flexibility in their academic concentration. Two foundation courses are specifically designed to allow students from diverse engineering and related backgrounds

to be successful. A simulation course developed using the strengths of the PhD program in Computational Science and Engineering.

The MS in Engineering: Automotive Systems further evidences CECS's dedication to responsiveness in academic innovation and effective initiatives vital to economic growth and workforce development. For additional information visit [UTC.EDU/MSAUTO](http://UTC.EDU/MSAUTO).



## Computational Science Doctorate Expansion of Specialties Includes Ph.D. Computational Science: Computer Science

The concentrations within the College's Ph.D. Program in Computational Science have been expanded. In addition to Computational Engineering, candidates for the terminal degree in Computational Science may now consider the Computer Science concentration. Students are afforded the resources of both the College and the SimCenter, Center of Excellence in Applied Computational Science and Engineering. The program is intended to be an interdisciplinary degree, offering broad exposure to applied mathematics, high performance computing, and a science or engineering application area. Due to the wide-scope of this interdisciplinary program, we expect various concentration areas will become available. These concentration areas allow for flexibility and will address educational and research priorities of regional, national, and global interest.

## MS Engineering Management Online Program Earns Distinctions

The MS Engineering Management Online Program was chosen as chosen as the #7 Best Online Engineering Graduate Program according to the U.S. News and World Report in 2014.

MS Engineering Management Online Program has also been chosen as the #20 Online Engineering Management graduate program in the nation according to the Top Management Degrees ([www.topmanagementdegrees.com/rankings/best-online-engineering-management-degree-programs-2016/](http://www.topmanagementdegrees.com/rankings/best-online-engineering-management-degree-programs-2016/)).

## New UTC Living Learning Community (LLC) for Engineering and Computer Science Students

The College of Engineering and Computer Science has joined with Housing and Residence Life at UTC to invite incoming CECS freshmen to apply for memberships in the newly established CECS Living Learning Community (LLC).

A Living Learning Community is a residential clustering of students who share academic or social and cultural interests.

These students also take classes together. Living Learning Communities provide a unique atmosphere for residents who share common interests and cultivate an environment that supports personal growth through academic and social programs.



Associate Dean Neslihan Alp is pictured with the CECS Living Learning Community residents.

## College of Engineering and Computer Science Five Year Strategic Plan

In concert with UTC's university-wide strategic plan, the College of Engineering and Computer Science has developed a Strategic Plan for the College's future for the next five years. Following the gathering of inputs from representatives of each of the College's constituent groups, the plan was reviewed by the College faculty prior to adoption in early Fall of 2016.

In his first weeks as Dean, Dr. Pack set this collaborative initiative as a priority for the College. He has welcomed the leadership and recommendations of Dr. Joseph Kizza, Chair of the Strategic Planning Committee, the campus and community representatives serving on the Committee, and the College Department Heads and Program Coordinators in this important effort. The completed CECS Strategic Plan was disseminated broadly, with input provided by the CECS Advisory Board Steering Committee members, students, faculty, department heads, and staff. At the July meeting, the Advisory Board Steering Committee gave its support of the plan.

In reflecting on the development and content of the Strategic Plan, Dean Pack said, "The 2015-2020 Strategic Plan for the College is a 'living' document. The goals, assessment measures, and benchmarks outlined in the Plan will be reviewed annually with inputs from each of the College's constituent groups in concert with the University's Strategic Plan. The CECS Plan is a clear roadmap for the College's future and the vision and efforts of all involved in its development."

## Development of Bachelor of Applied Science Degree

CECS is working closely with Chattanooga State Community College, area business leaders, and governmental officials in the development of a Bachelor of Applied Science degree program. Designed to further develop the professional management skills and of learners, and to meet the growing demand for leadership of highly technical professionals in the workplace, the BAS degree program at UTC will be the first of its kind in our area. In developing the program, the desires of students earning Associate of Applied Science degrees to complete a baccalaureate degree within two years of transfer is a key factor. The BAS degree will also be of great assistance to professional adults already holding associate degrees who wish to pursue upward mobility in their chosen fields.

Associate Dean Dr. Neslihan Alp is leading the College's development of the degree's curriculum proposal for review by campus entities and submission to the Tennessee Higher Education Commission (THEC) this fall. In tandem with review by THEC, open meetings with potential students, area educators, and local businesses will be held to share information about the program, with enrollment anticipated Fall, 2017.

## Re-Tooling of the SimCenter

The SimCenter is a center of excellence for research and education in modeling and simulation leveraging high-performance computing (HPC), for UTC and its stakeholders, with special emphasis on challenges in selected application focus areas.

The scientific, technical, and programmatic objectives of the SimCenter are aligned with problems of global, national, and regional importance and grouped in five focus areas:

### Aerospace and Defense

A long-time strength of the SimCenter has been in basic and applied research within the Aerospace and Defense sector. This sector has been at the forefront of using modeling and simulation for evaluation and design of vehicle and weapons technology. The SimCenter is well-positioned to contribute to hypersonic R&D and to realize other opportunities leveraging multi-physics modeling, simulation, and HPC.

### Energy & Environment

Challenges in this broad area relate to energy production, transmission, storage and efficient use; vehicle technology, transportation systems; critical infrastructures; dynamics of ecosystems, climate change impacts and adaptation, urban systems; and others. Modeling & Simulation are integral to solving a variety of critically important problems. The activities in these areas also intersect with the Urban Science and the Aerospace/Defense application areas.

### Health & Biological Systems

The SimCenter Health & Biological Systems focus area engages in effective collaborations with biomedical scientists from across the UTC and University of Tennessee Health Science Center's College of Medicine Chattanooga (UTC/MC) campuses to develop computational solutions for their research projects. The new UTC expert in computational biology is part of the SimCenter.

### Manufacturing

There is increasing emphasis on enhancing the manufacturing base and capabilities in the US. Modeling & Simulation and HPC have become an integral part of manufacturing in the areas of advanced manufacturing processes, conventional manufacturing processes, and supply chain analysis.

### Urban Science and Technology

Urban S&T represent a set of challenges that benefit greatly from modeling & simulation and involve data science challenges as well. The SimCenter's ability to collect, transmit and analyze data, and to derive information from large amounts of data enables modeling and simulation. This has been an area of rapid growth owing to increased National Science Foundation investment and to the Smart GigCity status of Chattanooga.

The selection of these application focus areas was based on three important criteria:

- The presence of significant scientific and technical challenges for which there was interest and expertise at UTC;
- Clear alignment with educational and workforce development missions of UTC;
- Opportunities to establish extramural R&D funding that can be realized by UTC researchers in strategic partnerships with collaborators at other institutions.



Reinhold C. Mann, Interim Director, SimCenter

The College of Engineering and Computer Science is committed to incorporating applied research into its programs. In performing research we seek to solve problems we face every day in our complex world.

During the past year, CECS real world research was conducted by each of the College's departments, and encompassed the synergy of teaching, learning, experimentation, and practical application. Involving students in interdisciplinary design, utilizing the expertise of technical staffers in innovation and discovery, supporting faculty initiatives in seeking funding sources for their research, and reaching out to community partners for identification of projects and for their support are all key components of the College's efforts to expand and strengthen its commitment to effective, innovative applied research.

A successful satellite launch, the discovery of a revolutionary testing procedure for transformers, new developments in cybersecurity, innovative use of recycled rice husks as an effective building material, initiation of unmanned aerial vehicle research, efficiency studies designed to better serve oncology patients and their physicians, and more were all part of the College's applied research efforts in 2015-16.

## Professor Awarded Prestigious Carnegie Fellowship Partners with University in Tanzania

Dr. Mbakisya Onyango, Associate Professor, Civil and Chemical Engineering, worked with the Mbeya University of Science and Technology (MUST) in Tanzania through the Carnegie African Diaspora Fellowship Program.

Alongside MUST faculty and students, Onyango researched the use of rice husks in construction materials for housing and structures in Tanzania. Natural soil (mud) blocks are widely used in the Mbeya region of Tanzania. The blocks are made from a mixture of water and soil, pressed into the block formations, and then either air/sun dried or burnt into blocks. The area's natural volcanic soil has cementitious properties, so the blocks naturally dry to become firm, strong materials for building.

Onyango's project analyzes the effects of stabilizing the soil in the blocks by adding locally sourced rice husks to the block mixture.

The Carnegie African Diaspora Fellowship program facilitates engagement between scholars born in Africa who are now based in the United States or Canada and scholars in Africa on mutually beneficial academic activities. The MUST project is one of 57 projects that paired African Diaspora scholars with higher education institutions in Africa to collaborate on curriculum co-development, research, graduate teaching, training, and mentoring activities.

Onyango was one of the 59 African Diaspora scholars awarded fellowships to travel to Africa in 2016. These fellowships support a wide range of projects across disciplines, from agroforestry to e-learning modules for nursing, and from ethnomusicology to military mental health.



“Discover new knowledge in engineering, engineering management, technology, and computer science.”

RESEARCH

## Innovative Research Honored at National Power and Energy Conference

At the Institute of Electrical and Electronics Engineers' (IEEE) Power and Energy Society (PES) in Boston, MA, in July 2016, Dr. Abdelrahman Karrar was joined by graduate students Mariana Kamel and Haytham Saeed in presenting their research on power network systems. Their conference paper: "On-site Low Voltage Determination of Zero Sequence Impedances for Station Auxiliary Transformers" was chosen as one of the conference's 4 best papers out of over 1000 papers and was named "best of the best" for its track.

"We were over the moon, naturally. This is an honor on the highest level!" said Karrar.

The trio's research was sponsored by a Tennessee Valley Authority (TVA) nuclear group. The research on open phase faults found new, more economical approaches to an otherwise extremely expensive test method. "The objective of our research was to develop a new, accurate, and yet affordable method to measure the zero sequence impedance of station transformers. This parameter has become critically important to understand and develop protection against open phase faults which have caused recent disruptions in the nuclear power plant industry. This transformative method is validated in the field and is being studied for implementation," explained Karrar.

Last year, graduate students Kamel and Saeed also received national recognition for their research and partnership with TVA.

Pictured left to right: Dr. Ahmed Eltom, Mariana Kamel, Haytham Saeed, Dr. Abdelrahman Karrar, and Mark Bowman (TVA).

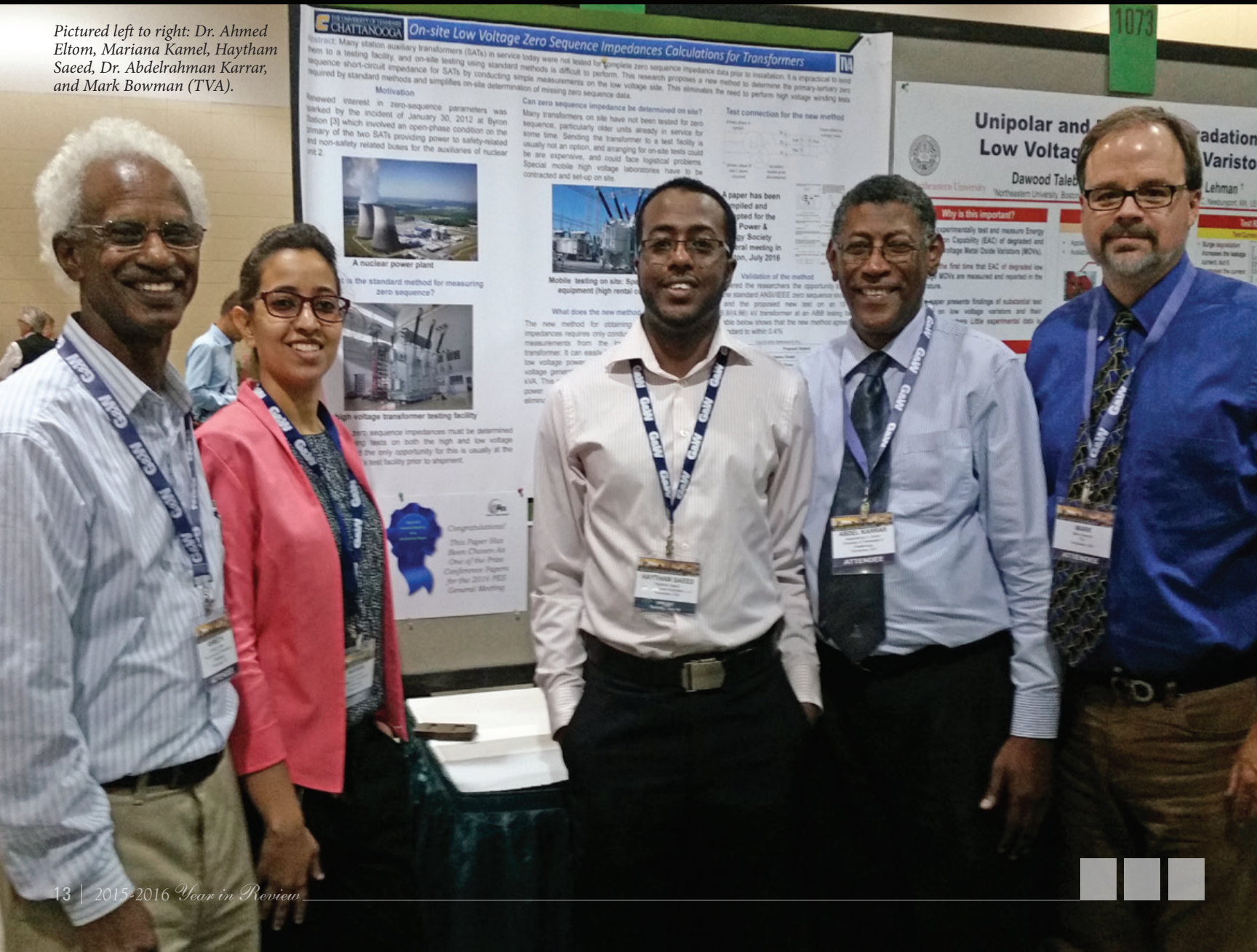


Image taken by MOCI at an altitude of 108,000 feet

## Students Launch Out-of-This-World High Altitude Balloon

In May 2016, Dr. Daniel Loveless led a team of 13 undergraduate and graduate students as they successfully launched and retrieved a high altitude balloon that peaked at an altitude of approximately 108,000 feet. The class, made up of Electrical and Computer Engineering majors, spent their spring semester designing, developing, testing, and reporting for a spacecraft subsystem, all in preparation for this pivotal demonstration.

"The primary objective was to launch a balloon payload to approximately 100,000 ft with communications and tracking systems for ground-tracking from launch to landing. To this end, the experiment was a success," Loveless said.

The balloon's 4.5 hour journey began in Chickamauga, GA. The craft traveled 150 miles before landing in Griffin, GA.

As the team worked throughout the semester, they relied heavily on research and technical literature to create their designs.

"The students learned how to navigate through highly technical concepts, critique the value of technical literature, and implement designs based on published findings," Loveless explained.

In addition to their enhanced research skills, the students gained invaluable experience easily transferable to the workplace.

"Teamwork was a BIG deal. However, the students also learned about real, and extreme, design constraints, beyond the typical ideal analysis covered in courses. For example, designing a structural sound system to handle the 100mph wind speeds encountered, and reliable electronics to operate at -50C. These are skills highly valued in the workplace and I think are invaluable lessons learned (through success and failures of designs)," added Loveless.

Students who worked on the project were Saama Davies, Benjamin Evans, Michael Holloway, Daniel Johnson, Matthew Joplin, Daniel Kelly, Grady McDonald, Geoffrey Nelson, Ameer Patel, Nichole Shelton, Joshua Suggs, Skylar Tinney, and Matthew Webb.

Dr. Daniel Loveless joined the CECS faculty in 2014. A native Chattanooga, Dr. Loveless returned to his hometown following several years of graduate studies at his alma mater, Vanderbilt University, where he served as an instructor, senior research engineer, and Research Assistant Professor in the Institute for Space and Defense Electronics. Dr. Loveless has authored 79 publications in the areas of modeling, design, and testing of integrated circuits for the evaluation of radiation

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*High Altitude Balloon (cont.)*

effects in advanced technologies spanning from 500 nm to 14 nm features sizes. While at CECS, his teaching and research have focused on advanced electronics, embedded systems, and integrated circuits.

Dr. Loveless' research initiatives have been funded by the Defense Threat Reduction Agency, NASA, Honeywell, Inc., and Boeing Aerospace among others, and he currently has grants in review by Oak Ridge Associated Universities and the National Science Foundation.

Dr. Loveless chairs the College's ABET Taskforce, and led CECS's efforts to retool effective course assessment methods. He is a member of the University-wide Departmental Honors Committee and is the Community Liaison for the Electrical Engineering Department. Through his efforts, the College has expanded its outreach mission with a number of community partners including the Hamilton County Department of Education, the Chattanooga Girls Leadership Academy, CO.LAB, and the Challenger STEM Learning Center. He is Senior Member of IEEE, and serves as co-advisor to the College's student chapter of that professional organization.

Dr. Loveless and his wife, Dr. Mary Loveless are the parents of Olivia Claire and William Gage. In their free time, the Loveless family enjoys running, swimming, cycling, SUPing, stargazing, adventuring, and most anything in great outdoors.



Students prior to launch of MOC1 on May 6, 2016. From left to right: Ameer Patel, Daniel Johnson, Michael Holloway, Matt Joplin, Samaa Davies, and Nichole Shelton

## Improving Rigid Pavement Smoothness Using PolyLEVEL Material

Dr. Mbakisy Onyango, Associate Professor, Joseph Owino, Department Head, Ignatius Fomunung, Professor, and Louie Elliott, Assistant Professor of UTC's Civil, Chemical, and Mechanical Engineering departments, and Aldo McLean, Assistant Professor of UTC's Engineering Management and Technology department, were awarded \$154,457 in January by the Tennessee Department of Transportation to conduct research on improving rigid pavement smoothness through the use of PolyLEVEL.

Concrete pavement slab drop-off is among the major problems that are encountered with concrete pavements after years of service. In addition to poor load transfer between slabs and the eventual need for dowel retrofit and concrete slabs correction, it poses a safety hazard to motorists and productivity loss for the society.

This study evaluates the improvement of rigid pavements smoothness using injected PolyLEVEL to lift concrete slabs in order to extend the life of concrete pavements and increase road users' safety and comfort. The study evaluates the dependability of the material immediately after installation and in the long term. Long-term performance monitoring of the pavements will be evaluated using the International Roughness Index (IRI) measurements and visual inspections every 6 months. In addition, the cost of using PolyLEVEL, asphalt, and mud jacking will be compared, and computational modeling of PolyLEVEL material to evaluate its response to traffic loading will be performed.

## 2015-2016 Research Awards

**Abdollah, Arabshahi**

**Proposal title:** Computational Simulations of the Aerothermal Environment of Hypersonic Flight Vehicles

**Funding agency:** THEC Center of Excellence in Applied Computational Science & Engineering (CEACSE)

**Amount:** \$97,859

**Elliott, Trevor**

**Proposal title:** Baja SAE Capstone Project

**Funding agency:** DENSO North American Foundation

**Amount:** \$50,000

**Elliott, Trevor**

**Proposal title:** Investigation of Resources and Plan for an Advanced Manufacturing Applications Center (AMAC) at UT-Chattanooga

**Funding agency:** THEC Center of Excellence in Applied Computational Science & Engineering (CEACSE)

**Amount:** \$23,400

**Eltom, Ahmed**

**Proposal title:** Research in Open Phase on Auxillary Transformers

**Funding agency:** Tennessee Valley Authority

**Amount:** \$50,000

**Harris, Bradley**

**Proposal title:** TBAEE Laboratory Equipment Grant for Chemical Engineering

**Funding agency:** Tennessee Board of Architectural and Engineering Examiners (TBAEE)

**Amount:** \$26,761

**Hilbert, C. Bruce\***

**Proposal title:** Grid Consultation Services for CASL (Consortium for Advanced Simulation of Light Water Reactors)

**Funding agency:** UT-Battelle - Oak Ridge National Laboratory

**Amount:** \$10,000

**Karman, Steve\***

**Proposal title:** Adaptive Meshing of Ship Air-Wake Flowfields

**Funding agency:** Office of Naval Research

**Amount:** \$54,845

**Loveless, Daniel**

**Proposal title:** Modeling Space and Defense Environmental Effects in Emerging Integrated Circuit Technologies

**Funding agency:** THEC Center of Excellence in Applied Computational Science & Engineering (CEACSE)

**Amount:** \$25,213

**Newman III, James**

**Proposal title:** Investigation of Higher-Order Accuracy for Large Eddy Simulations

**Funding agency:** Office of Naval Research

**Amount:** \$117,616

**Newman III, James**

**Proposal title:** FUNSAFE Framework Development for Enhanced Multidisciplinary and Multiphysics Simulations

**Funding agency:** THEC Center of Excellence in Applied Computational Science & Engineering (CEACSE)

**Amount:** \$94,087

**Onyango, Mbakisy**

**Proposal title:** Traffic Data Input for Mechanistic Empirical Pavement Design Guide (MEPDG) for the State of Tennessee

**Funding agency:** Tennessee Department of Transportation (TDOT)

**Amount:** \$172,055

**Onyango, Mbakisy**

**Proposal title:** Evaluation of Geosynthetics Reinforcement in Flexible Pavement Structures Using Accelerated Pavement Testing

**Funding agency:** University of Tennessee-Knoxville

**Amount:** \$45,915

**Onyango, Mbakisy**

**Proposal title:** Improving Rigid Pavement Smoothness Using PolyLEVEL Materials

**Funding agency:** Tennessee Department of Transportation (TDOT)

**Amount:** \$154,457

**Pack, Daniel**

**Proposal title:** Extending GPS Operation in GPS-denied Areas through Cross-Correlation Jamming Cancellation

**Funding agency:** United States Air Force Academy

**Amount:** \$192,877

**Pack, Daniel**

**Proposal title:** A Strapdown Image-based Guidance on Virtual Field of View

**Funding agency:** University of Texas - San Antonio

**Amount:** \$136,709

**Pack, Daniel**

**Proposal title:** Cooperative Technology Development

**Funding agency:** Office of Naval Research

**Amount:** \$65,625

**Reising, Don**

**Proposal title:** Smart Buildings through Smarter Models

**Funding agency:** THEC Center of Excellence in Applied Computational Science & Engineering (CEACSE)

**Amount:** \$99,753

**Sartipi, Mina**

**Proposal title:** Intelligent Urban Planning

**Funding agency:** THEC Center of Excellence in Applied Computational Science & Engineering (CEACSE)

**Amount:** \$97,942

## 2015-2016 Research Awards (cont.)

### Sartipi, Mina

**Proposal title:** Smart Urban Connectivity Powered by Mobility-on-Demand Public Transportation and Citywide Public Communications  
**Funding agency:** THEC Center of Excellence in Applied Computational Science & Engineering (CEACSE)  
**Amount:** \$95,503

### Sisworahardjo, Nur

**Proposal title:** Near Real-Time Detection of Anomalous Power Consumption in Smart Power Distribution Networks  
**Funding agency:** THEC Center of Excellence in Applied Computational Science & Engineering (CEACSE)  
**Amount:** \$96,477

*\*Faculty member left the University during 2015-16.*

### Sreenivas, Kidambi

**Proposal title:** Towards Simulation of Vertical Axis Wind Turbines in Offshore Settings  
**Funding agency:** THEC Center of Excellence in Applied Computational Science & Engineering (CEACSE)  
**Amount:** \$96,477

### Tanis, Craig

**Proposal title:** Optimizing FUNSAFE for Leadership-class Machines  
**Funding agency:** THEC Center of Excellence in Applied Computational Science & Engineering (CEACSE)  
**Amount:** \$86,741

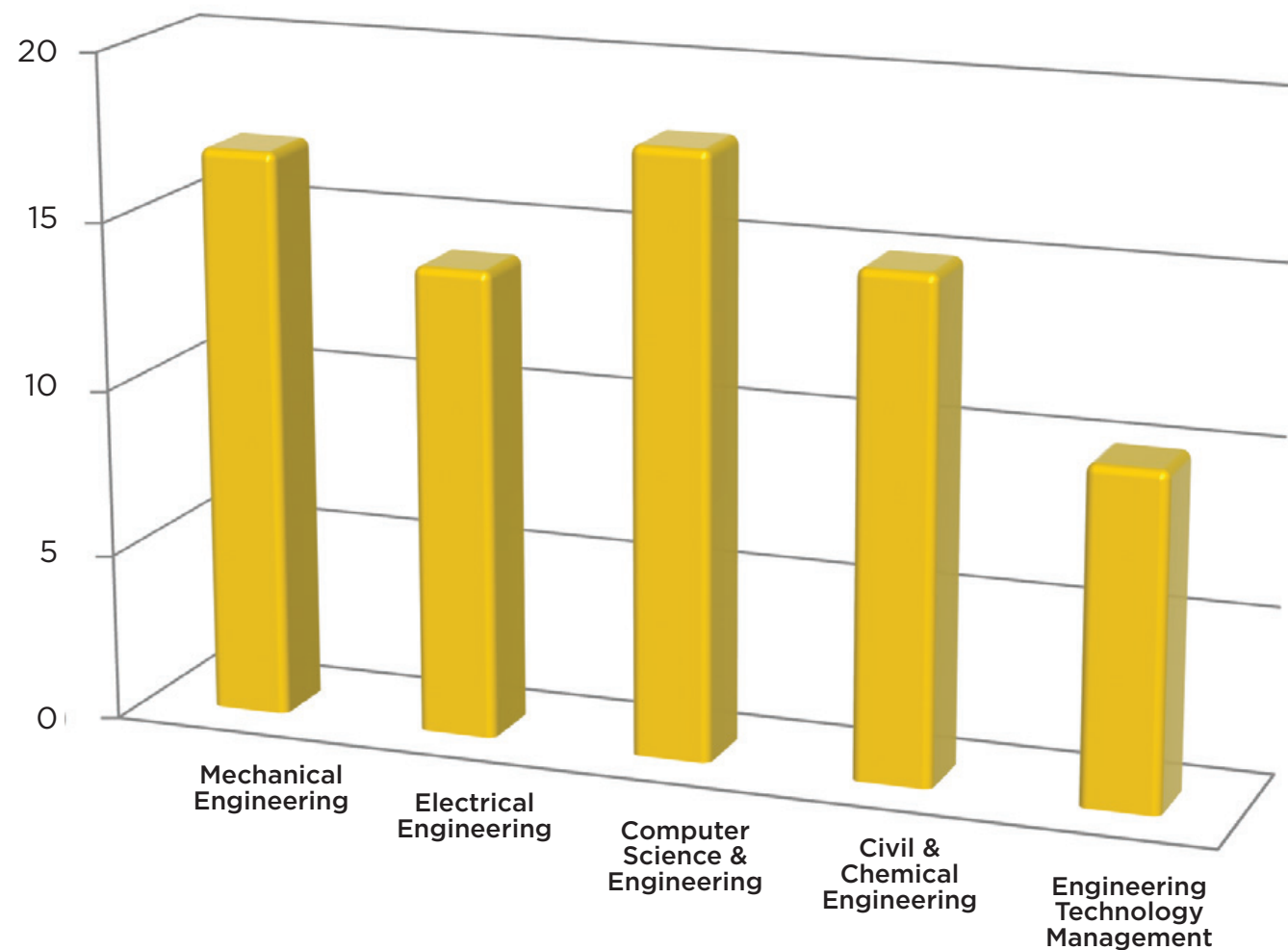
### Webster, Robert

**Proposal title:** Numerical Simulations of Axial Compressor Flow Fields Employing Higher-Order Accuracy  
**Funding agency:** THEC Center of Excellence in Applied Computational Science & Engineering (CEACSE)  
**Amount:** \$24,140

### Wu, Dalei

**Proposal title:** Multiscale Serviceability Analysis and Assessment of Urban Infrastructure  
**Funding agency:** THEC Center of Excellence in Applied Computational Science & Engineering (CEACSE)  
**Amount:** \$95,610

## 2015-2016 CECS Publications and Invited Presentations



The triad mission of the College moves our region forward. CECS's community engagement is key to its fulfillment of that mission. The College's outreach and engagement initiatives make a difference in the lives of our students and those in communities across our region.

Enabling social and economic progress through mutually beneficial outreach partnerships enhances our students' experiential learning, and strengthens the value of their degrees. Outreach partnerships provide exposure to real-world, industry environments, allowing our students to enter the workforce with applicable hands-on experience and critical thinking skills.

The internships, senior design capstone projects with public and private sector partners, service efforts by the College's student organizations, and other outreach initiatives inspire and empower scholarship, public service, and entrepreneurship while expand the College's service learning and civic engagement.

## Chattanooga Society of Black Engineers Sponsors ACT Workshop

On Saturday, January 30, 2016, the Chattanooga Chapter of the National Society of Black Engineers sponsored an ACT preparation workshop for forty area high school students. CECS Dean Dr. Daniel Pack welcomed the participants, and Admissions Counselor Terrance Banks shared information about UTC.

Pictured below with the student participants, NSBE members were joined by CECS faculty members Drs. Joseph Owino, Soubantika Palchoudhury, and Nurhidajat Sisworahardjo who taught sessions on both test content and strategies. During the morning workshop, students also took a sample ACT test.

2016 marks the seventh year the UTC NSBE chapter has sponsored semi-annual ACT workshops for area high school sophomores, juniors, and seniors, as part of the chapter's community service commitment. Civil Engineering faculty member Dr. Mbakisaya Onyango serves as faculty advisor to the campus chapter. The collegiate membership in NSBE is open to any undergraduate or graduate students enrolled in science, technology, engineering, or mathematics.

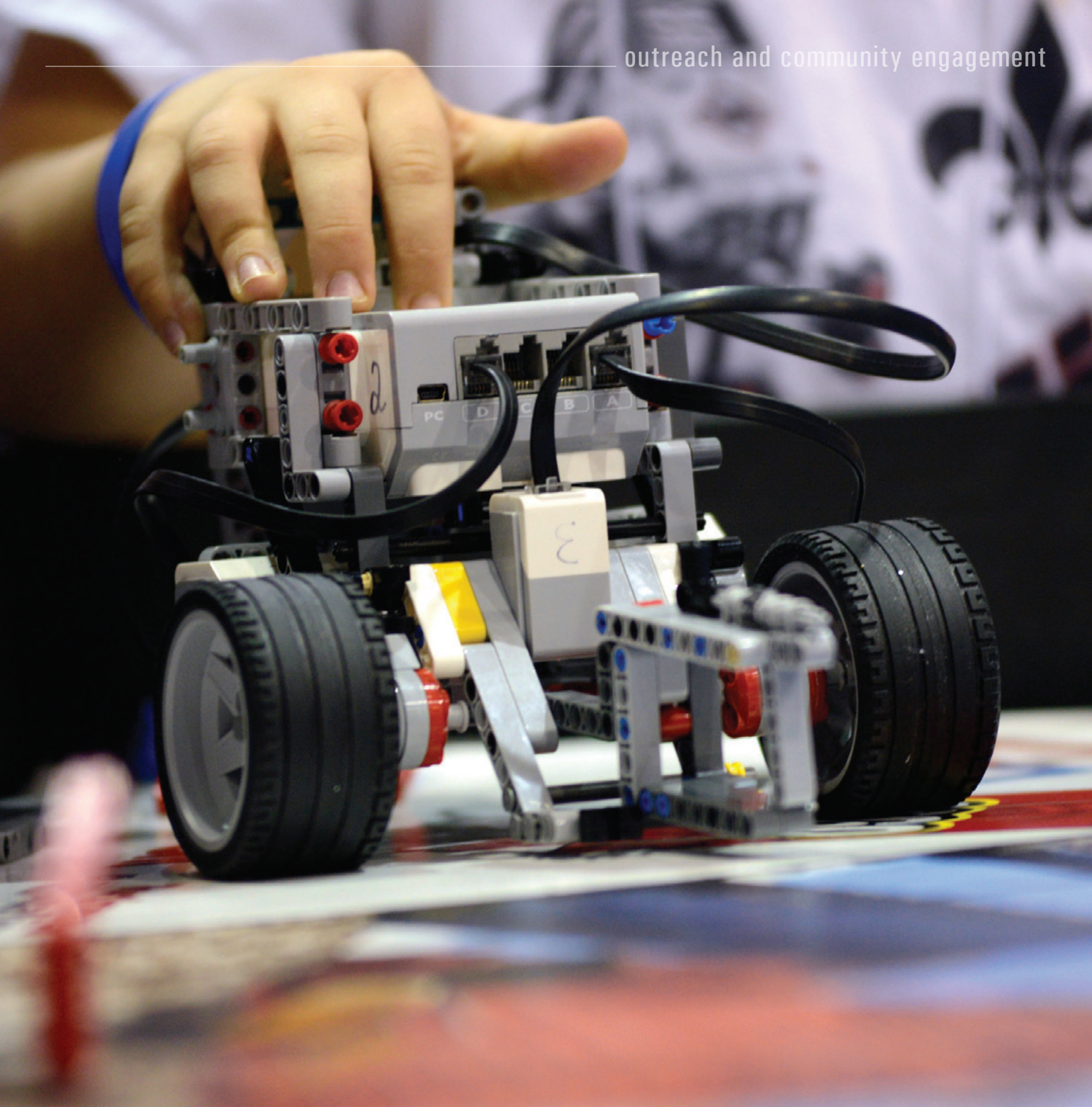
## CECS Hosts SQL Saturday

On June 25, 2016, the College hosted SQL Saturday – a day-long training event designed for server professionals to learn about innovations in the use of Structure Query Language. Widely used in managing database systems, SQL is an essential tool in both public and private sector settings. CECS was pleased to join local and regional partners in both sponsoring and hosting the event. SQL Saturday was coordinated by CECS Computer Science alumnus Larry Ortega, a TVA professional who also serves as Co-Chapter Leader of the SQL Professionals of Chattanooga.



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Computer Science and Engineering Department Head Dr. Joseph Kizza and several members of his faculty joined in welcoming over 200 computer science professionals to the event as a part of CECS's outreach to the extended community. The workshops and social interactions of SQL Saturday provided an opportunity to showcase the College's programs and facilities, while also reconnecting with CECS alumni and friends.



## IEEE Robotics Competitions in December 2015 and January 2016

The Electrical Engineering Department's efforts coordinated by Dr. Abdul Ofoli and Professor Richard Manning, through sponsorship by TVA, continue to expand the College's involvement with area teachers and students in important robotics education and competition. In December, 2015 and January, 2016, the College served as venue, and a sponsor, for two IEEE Robotics competitions which focused on science and technology offerings for elementary and middle school youth and their teachers.



## Tennessee Valley Public Power Association Technicians Train in CECS EE Labs

The Tennessee Valley Public Power Association, Inc. (TVPPA) is the nonprofit, regional service organization representing the interests of consumer-owned electric utilities operating within the Tennessee Valley Authority (TVA) service area. TVPPA members include both municipal and electric cooperatives, serving more than 9 million customers in Alabama, Georgia, Tennessee, Mississippi, Kentucky, North Carolina, and Virginia.

On Wednesday, February 10, 2016, twenty-one area technicians participated in training utilizing the College's electrical engineering laboratories with simulations of smart switches, relays, power connectivity, and metering. CECS welcomed the opportunity to partner with TVPPA as a training site for technicians and engineers.

The Electrical Engineering Department's linkages to TVPPA through the College's valued partnership with TVA in a number of key research and instruction initiatives are one component of CECS's commitment to outreach and community service.



## CECS Career Fairs

All CECS students and alumni were invited to network with over 60 area employers participating in the College's bi-annual Career Fairs. In October and March, company representatives shared information regarding internships and full-time employment opportunities available in each engineering discipline and computer science.

By hosting these Career Fairs in the Engineering, Math, and Computer Science Building, the College seeks to facilitate students' access to potential employers prior to graduation.





## CECS Reaching Out With Expertise and Sweat Equity

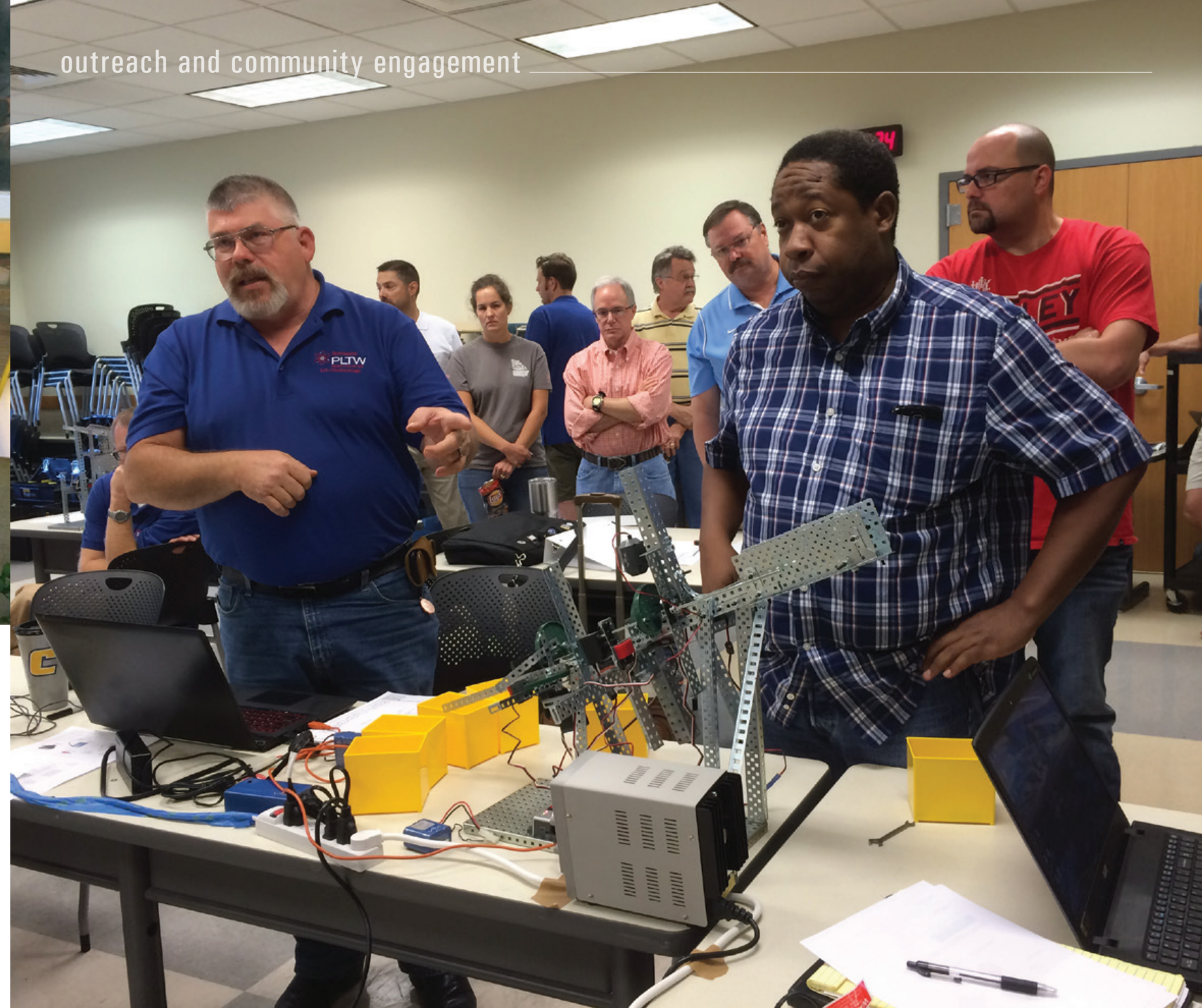
During the Spring and Summer, students in the Engineering Management and Technology once again contributed their expertise and sweat equity to Habitat for Humanity in the Chattanooga community and in their hometowns. Since 1976, Habitat for Humanity has made homeownership a dream come true for hundreds of families in our nation and across the world, recognizing the strength, stability, and independence that result from safe, affordable housing. The relationships formed through the hours spent working shoulder to shoulder with Habitat families are of immeasurable value to the CECS students who are part of this important annual effort.

Through their work in support of Habitat for Humanity, CECS students are able to apply the knowledge and skills they have gained in their classroom experiences to hands-on applications that benefit individual families and their extended communities. Project coordination, the acquisition of materials, on-site construction, and the implementation of energy efficiency and sustainability features are all part of the experiential learning that students gain thorough their work with Habitat. The CECS faculty and students partner in this initiative with the local construction community and the area membership of the Associated General Contractors.

## Recent CECS Visit Days

In March 2016, in partnership with the Admissions Office, the College sponsored a CECS Visit Day. Coordinated by Mechanical Engineering Department Head Dr. Gary McDonald, the Visit Day featured a tour of the College and panel presentations by faculty and students for incoming freshman prospective students who have indicated engineering or computer science as their potential majors. The students and their families spent an informative and enjoyable afternoon learning about the curriculum, student organizations, research initiatives, and other activities of the College.

CECS Chemical Engineering alumnus, Chemical Engineering Advisory Board member, and Chattem Chemical executive, Jason Allen and Dr. Frank Jones, Chemical Engineering Professor, coordinated a visit to the College by 60 North Alabama high School sophomores, juniors, and seniors and their teachers. During their visit, the participants toured the College's labs, learned about the various majors offered, and saw a demonstration by members of the Chem-E-Car Team.



One of the projects educators worked on in the classroom were creating machines that would sort marbles, based on criteria like weight, material type, or color.

## Project Lead the Way – CECS STEM Outreach to K-12 Students and Educators

In July, CECS once again welcomed K-12 teachers from across the nation engaged in professional development through participation in the STEM curriculum of Project Lead the Way (PLTW). Project Lead the Way is a non-profit organization designed to provide elementary and secondary educators with the training, resources, and support to engage their students in real-world learning in the key areas of engineering and computer science.

Each July for the past twelve years, CECS has hosted Project Lead the Way workshops for teachers as a component of its commitment to K-12 outreach. By creating hands-on classroom environments, designed to help students and their teachers, the college enhances and expands in-demand STEM knowledge and skills of teachers in STEM fields. This year, 36 K-12 teachers joined with faculty and staff of the College for two weeks of learning engaged in empowering the next generation of engineers and computer scientists.



## Career and Service Opportunity: CECS Senior Jonathan Ingram, E6 Petty Officer, USN

Senior CECS Electrical Engineering student Jonathan Ingram is participating in a unique service learning program offered by the US Navy. Based on his academic record and following an extensive and highly competitive application and interview regimen with USN officials in Charleston, SC, and Washington, DC, Jonathan was selected to join the Nuclear Power Training Command's Nuclear Propulsion Officer Candidate Program (NUPOC). As a feature of the program, he enlisted and currently serves as an E6 Petty Officer while still enrolled as a full-time student in the College. After graduation this May and his commissioning as an Ensign, Jonathan will complete Officer Development School. Jonathan's immediate duty assignment will be at Joint Base Charleston as an instructor of enlisted personnel training to serve as nuclear reactor operators on USN submarines.



Jonathan Ingram

In assessing the academic programs of the College as preparation for his chosen career, Jonathan believes that the teaching and research opportunities afforded him at CECS will serve both him and our nation well. The faculty and staff congratulate Jonathan and extend thanks for his current and future service.

## Faculty Awards and Distinctions 2015-2016

- **Dr. Neslihan Alp**, Engineering Management & Technology, was the recipient of the Unbought and Unbossed Award from Girls, Inc. and was also named one of two University Outstanding Advisor Award recipients for 2015-16.
- **Dr. Ignatius Fomunung**, Civil Engineering, was named 2015 Faculty Advisor of Year by the American Society of Civil Engineers (ASCE).
- **Dr. Michael Jones**, Mechanical Engineering, was recently selected to be a member of the Inaugural All-Southern Conference Faculty Team.
- **Dr. Abdelrahman Karrar**, Electrical Engineering, had paper was named "best of the best" for its track at this year's General Meeting for the Institute of Electrical and Electronics Engineers' (IEEE) Power and Energy Society (PES) in Boston, MA.
- **Dr. Daniel Loveless**, Electrical Engineering, Category Winner for UTC's Inaugural Elevator Speech Competition, 2016 UTC Research Dialogues.
- **Dr. Gary McDonald**, Mechanical Engineering, received the University Outstanding Serving Students and the Public Award.
- **Dr. Mbaki Onyango**, Civil Engineering, is one of the 59 African Diaspora scholars awarded fellowships through the Carnegie African Diaspora Fellowship Program in 2016.
- **Dr. Mina Sartipi**, Computer Science and Engineering, received the University Outstanding Research Award for 2015-16.
- **Dr. Endong Wang**, Engineering Management & Technology, was the recipient of a 2016 UTC Faculty Pre-Tenure Enhancement Program (PREP) award.
- **Dr. Weidong Wu**, Civil Engineering, was the recipient of a UTC Faculty Grant in support of his proposal entitled: "Finite element thermal crack analysis of prestressed double tee canopy beams".

Dr. Jones and Dr. Margraves in the Wind Tunnel Laboratory

## "Tennessee Jones" Marks 40 Years of Teaching

In 2015-16, Dr. Mike Hilton "Tennessee" Jones, marked his fortieth year of teaching in the College of Engineering and Computer Science. Multiply recognized by the Campus Student Government Association and the CECS students for excellence in teaching, Dr. Jones utilizes his teaching expertise, imagination, appreciation of the fictional college professor "Indy" Jones, and his artistic talent to engage his students. For four decades, his "Tennessee" Jones test problems have challenged the problem-solving skills of hundreds of CECS students in courses ranging from Vector Statics to Advanced Fluids. It has become somewhat of a CECS tradition to compare post-exam reflections on the latest "Tennessee" Jones adventure problem.

Dr. Jones' commitment to UTC's students extends beyond the classroom, as for more than thirty years, he has devoted countless hours as volunteer photographer for the MOCS Cross-Country and Track Teams. As teacher, team supporter, and mentor, Dr. Jones had the honor and pleasure of working with a promising engineering student and MOCS runner, Charles "Chuck" Margraves. In circumstances that speak to the dedication of both men to CECS – and the College's commitment to teaching excellence – Dr. Jones now has the honor of calling Dr. Margraves a colleague. Dr. Margraves joined Dr. Jones as a member of the College's Mechanical Engineering faculty in 2013.

When asked about the influence of Dr. Jones and his teaching on his life and those of other CECS students, Dr. Margraves said, "Dr. Jones has been a mentor to me and so many other students both inside and outside of the classroom. The effect he has had on my life has been immense. Were it not for him I do not believe I would have considered teaching at the college level. I consider the relationship I have been fortunate to have with Dr. Jones to be one of my life's greatest blessings".



Dr. Mike Jones

# CECS Alumni Legacy: David and Amanda Wade



David Wade and daughter, Amanda Wade Hodges

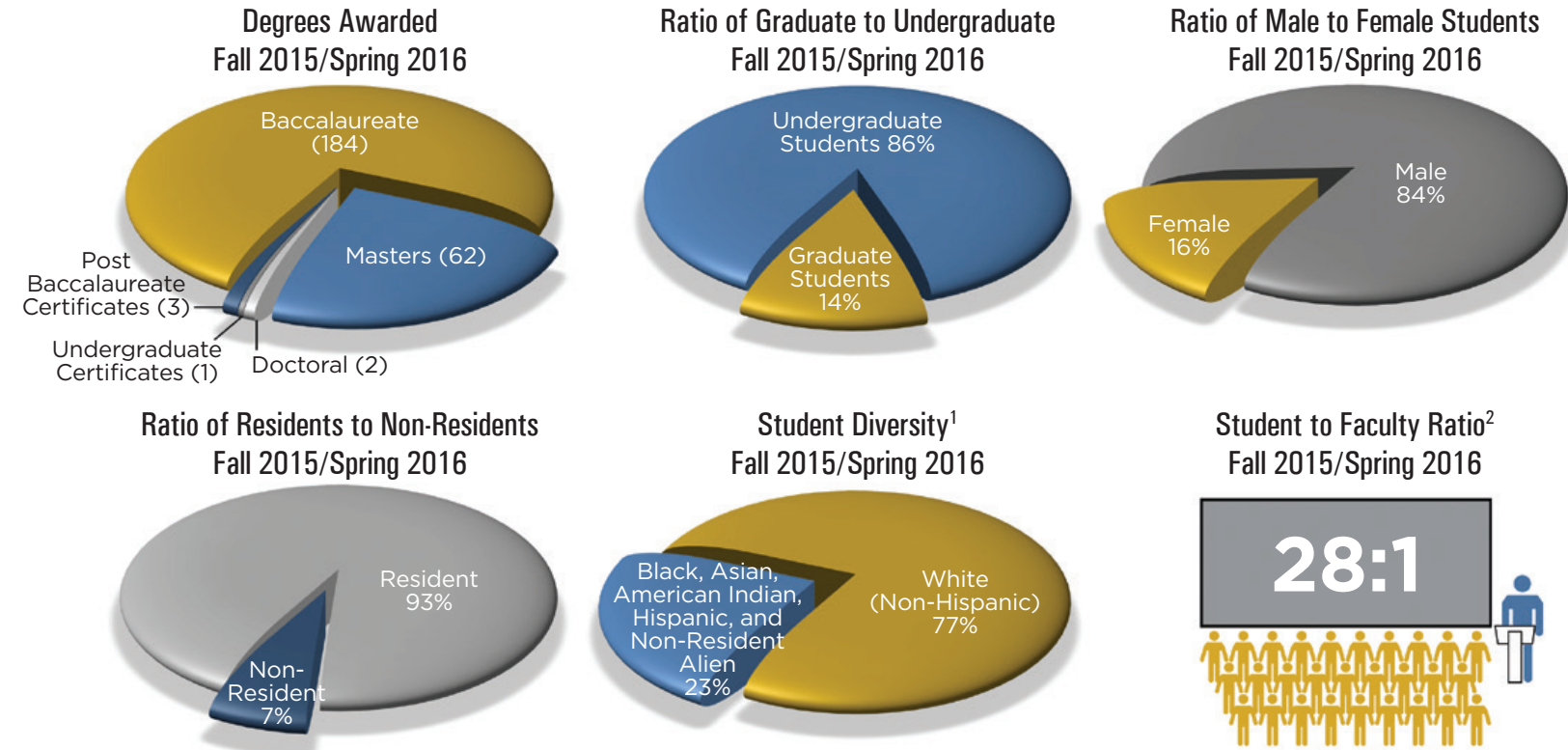
UTC's May 7, 2016 graduation marked an important milestone in the lives of all 163 CECS graduates whose degrees were conferred that morning. That date was also a cause for anniversary celebrations for several legacy alumni families in the College. The Wade family of Chattanooga is one of many such CECS alumni legacies.

David Wade, President and CEO of the Electric Power Board (EPB) of Chattanooga, is a graduate of the College's Engineering Management and Technology Program, and his daughter, Amanda, is a 2016 graduate of our Chemical Engineering Program. Both David and Amanda are actively involved with CECS. David serves as a member of the College's Steering Committee, and Amanda continues her participation as an active alumna in support of many CECS activities. David led EPB's effort to design and build the country's most automated electric power distribution system. Using a 100% fiber optic network as the backbone for the Smart Grid, he was instrumental in launching a new business, EPB Fiber Optics, which delivers Gigabit speed

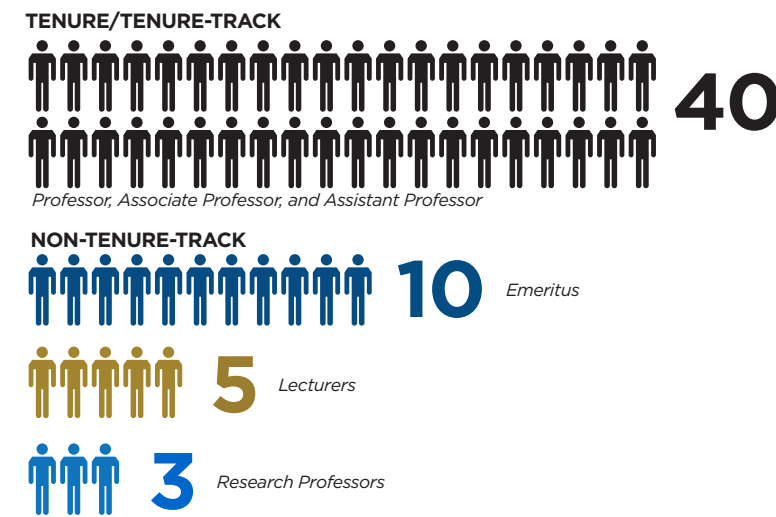
Internet, television, and telephone service. During her enrollment in the College, Amanda served as a member of the Dean's Student Advisory Committee and as captain of the Chem-E-Car Team. Following an internship with BASF, she was recruited by companies in our area and accepted a full-time position with BASF. Amanda is married to fellow Chemical Engineering Alum and Chem-E-Car team member Nathan Hodges.

The support of the College's alumni is vital to its continued success. One of the best "investments" our alumni make in the present and future of CECS is encouraging their children, friends, neighbors, and associates to visit and explore the programs and opportunities afforded by enrollment in the College. We welcome visitors, and encourage you to contact Kirby Johnson at Kirby-Johnson@utc.edu to arrange for individual or group tours. Thanks to the Wades and all 4000 + CECS alumni!

## college data



## FACULTY



2015-16 Research Expenditures:  
**\$1.06 million**  
Research expenditures include subcontracts and internally funded projects.

2015-16 Research Awards:  
**\$2.03 million**  
Research awards include subcontracts and internal CEACSE projects.

<sup>1</sup> Diversity % includes Black, Asian, American Indian, Hispanic, and Non Resident Alien racial and ethnic categories.  
<sup>2</sup> The student to faculty ratio was calculated following the same formula as defined in the Common Data Set. The ratio reported is of full-time equivalent students (FT + 1/3 PT) to full-time equivalent instructional faculty (FT + 1/3 PT). Computational Engineering students and faculty were excluded from this calculation as they are considered a stand-alone graduate program.

DEGREES OFFERED	ENGINEERING	COMPUTER SCIENCE & ENGINEERING	
	<b>Bachelor of Science</b> <ul style="list-style-type: none"> <li>Chemical Engineering (B.S.Ch.E.)</li> <li>Chemical Engineering: Environmental (B.S.Ch.E.)</li> <li>Civil Engineering (B.S.C.E.)</li> <li>Civil Engineering: Environmental (B.S.C.E.)</li> <li>Electrical Engineering (B.S.E.E.)</li> <li>Mechanical Engineering (B.S.M.E.)</li> </ul>	<b>Bachelor of Science (B.S.)</b> <ul style="list-style-type: none"> <li>Computer Science with concentrations in                             <ul style="list-style-type: none"> <li>Computer Engineering</li> <li>Data Science</li> <li>Information Security and Assurance</li> <li>Scientific Applications</li> <li>Software Systems</li> <li>STEM Education</li> </ul> </li> </ul>	<b>Minor</b> <ul style="list-style-type: none"> <li>Computer Science</li> </ul> <b>Undergraduate Certificates</b> <ul style="list-style-type: none"> <li>Advanced Information Systems Security</li> <li>Information Systems Security</li> </ul>
	<b>Master of Science (M.S.)</b> <ul style="list-style-type: none"> <li>Engineering: Automotive Systems</li> <li>Engineering: Chemical (Chemical Sciences or Environmental)</li> <li>Engineering: Civil</li> <li>Engineering: Computational</li> <li>Engineering: Electrical</li> <li>Engineering: Industrial</li> <li>Engineering: Mechanical (Energy or Mechanics)</li> </ul>	<b>ENGINEERING MANAGEMENT &amp; TECHNOLOGY</b> <ul style="list-style-type: none"> <li><b>Bachelor of Science (B.S.)</b> <ul style="list-style-type: none"> <li>Engineering Technology Management with concentrations in                                     <ul style="list-style-type: none"> <li>Construction Management</li> <li>Engineering Management</li> </ul> </li> </ul> </li> </ul>	<b>Master of Science (M.S.)</b> <ul style="list-style-type: none"> <li>Computer Science with concentrations in                             <ul style="list-style-type: none"> <li>Computer Science</li> <li>Information Security and Assurance</li> <li>Data Science</li> </ul> </li> </ul>
<b>Ph.D. Programs</b> <ul style="list-style-type: none"> <li>Computational Science with concentrations in                             <ul style="list-style-type: none"> <li>Computational Engineering</li> <li>Computer Science</li> </ul> </li> </ul>	<b>POST-BACCAULAUREATE CERTIFICATE PROGRAMS</b> <ul style="list-style-type: none"> <li><b>Post-Baccalaureate Certificates</b> <ul style="list-style-type: none"> <li>Biomedical Informatics</li> <li>Nuclear Engineering</li> <li>Power System Protection</li> <li>Smart Grid</li> <li>Smart Power Distribution</li> </ul> </li> <li>Sustainable Electric Energy</li> <li>Construction Management</li> <li>Fundamentals of Engineering Management</li> <li>Leadership and Ethics</li> </ul>	<ul style="list-style-type: none"> <li>Logistics and Supply Chain Management</li> <li>Power Systems Management</li> <li>Project and Technology Management</li> <li>Quality Management</li> </ul>	

## COLLEGE OF ENGINEERING AND COMPUTER SCIENCE 2015-2016 ADVISORY BOARD

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