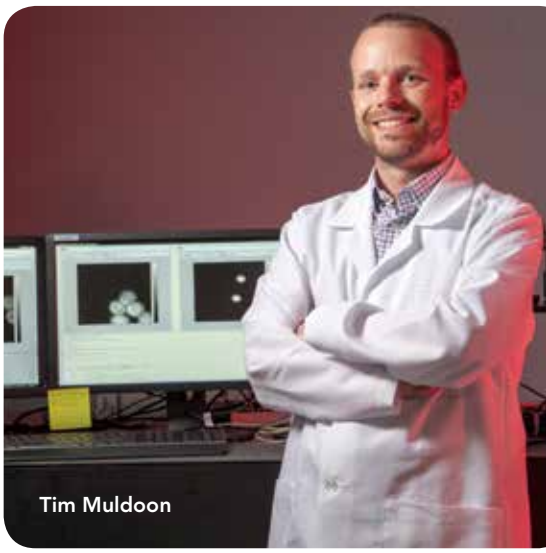

Michelle Bernhardt-Barry


Qinghua Li


Tim Muldoon


Gary Prinz

IT'S A RECORD!

7 NSF CAREER AWARDS

UNIVERSITY OF ARKANSAS
College of Engineering


Ben Runkle


Kelly Sullivan


Yue Zhao

7

College of Engineering

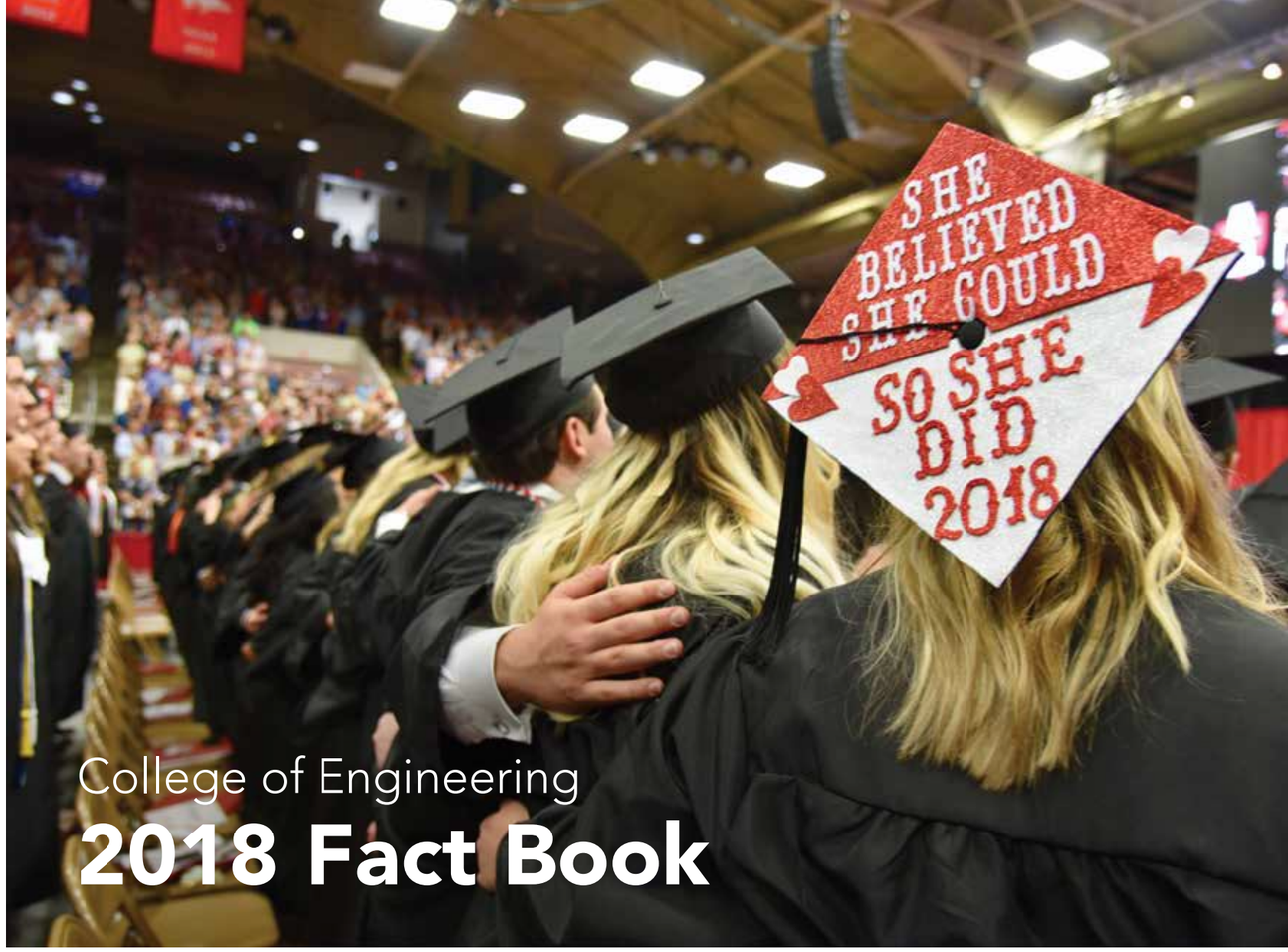
2018 Fact Book

UNIVERSITY OF ARKANSAS

AS DEAN OF ENGINEERING, it is my pleasure to present the 2018 College of Engineering Fact Book. The data found in this book reflects the College's progress toward fulfilling our strategic goals. Our faculty, staff and students are committed to excellence in research, scholarship and education. Each page of the book tells the story of all the ways we're working to fulfill that commitment every day. To that end, the Fact Book is organized based on which strategic goal the data and stories support. We're proud of our work to improve lives in Arkansas and around the world, and we're grateful for people like you, whose interest in the College of Engineering helps make it happen.

Warmly,

John English
Dean, College of Engineering
Irma F. and Raymond F. Giffels Endowed Chair in Engineering



College of Engineering

2018 Fact Book

Pictured on cover (L to R)

Michelle Bernhardt-Barry
assistant professor of civil engineering

Qinghua Li
assistant professor of computer science and computer engineering

Tim Muldoon
associate professor of biomedical engineering

Gary Prinz
assistant professor of civil engineering

Ben Runkle
assistant professor of biological and agricultural engineering

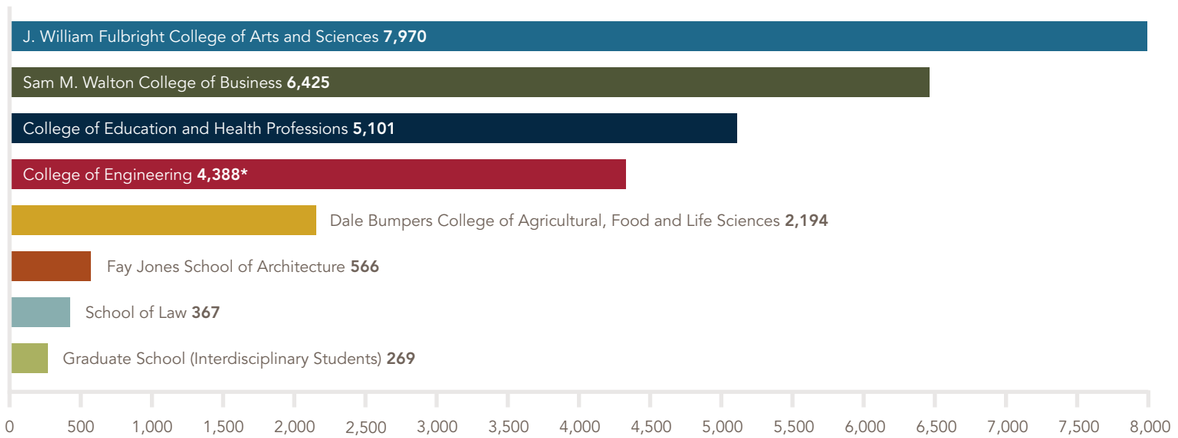
Kelly Sullivan
assistant professor of industrial engineering

Yue Zhao
assistant professor of electrical engineering

University of Arkansas

Highlights

University of Arkansas Fall 2018 Enrollment (degree-seeking only)

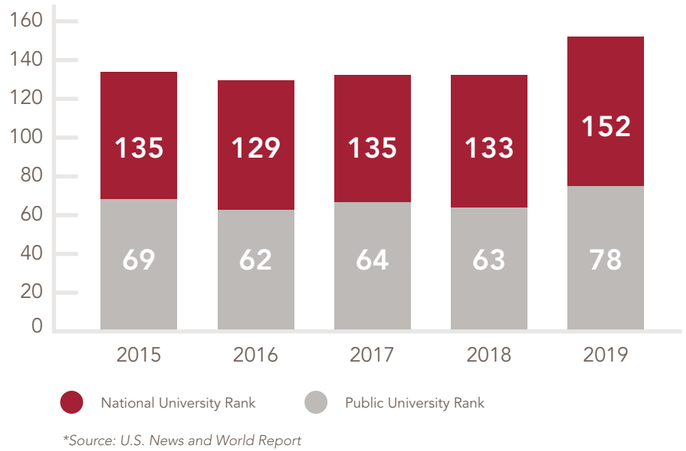


** Excludes interdisciplinary graduate students*

Fall 2018 Enrollment

23,386	4,024	368	27,778
Undergraduate	Graduate	Law	Total Enrollment

University of Arkansas Rankings*



**Source: U.S. News and World Report*

College of Engineering

Highlights

3,490
Undergraduate Students*

943
Graduate Students**

4,433
College of Engineering Total Enrollment

Total undergraduate enrollment is **up 2.9%** over 2017.

Our 2018 undergraduate enrollment is **24% female.**

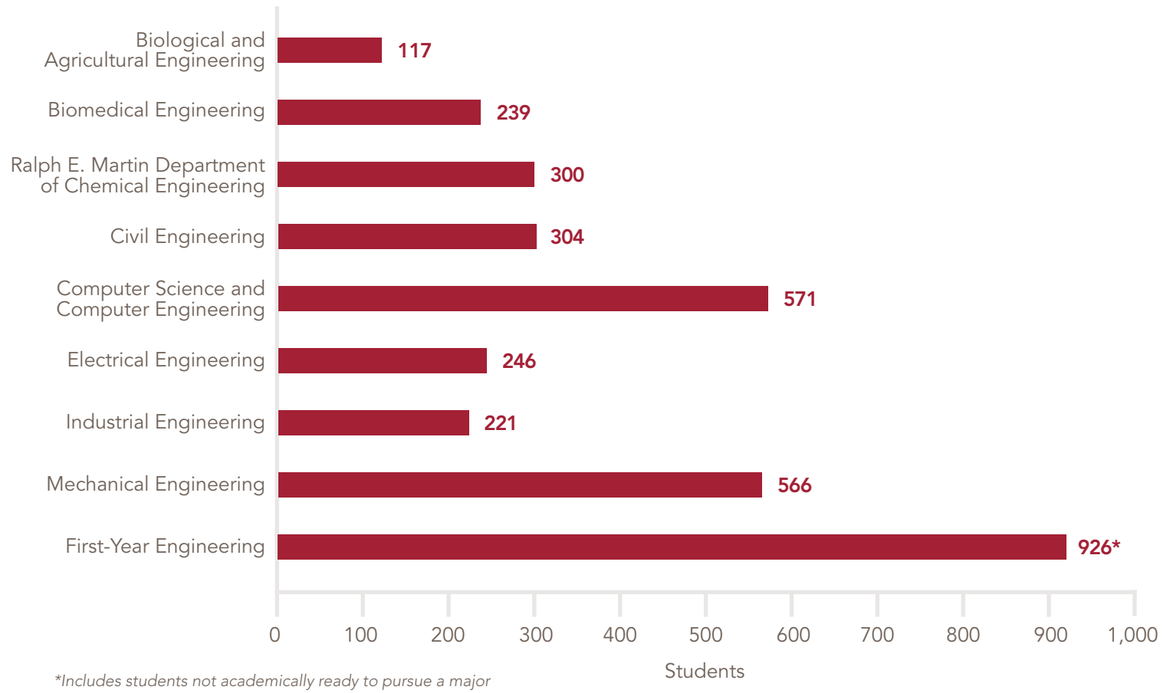
Ph.D. enrollment **increased 9.0%** over 2017.

Underrepresented students — female, minority, and first-generation college students — make up **50.6%** of the First-Year class.

**Degree-seeking only*
***Includes engineering students enrolled in Interdisciplinary Programs and Distance Education*

816 new First-Year students, with 500 from Arkansas

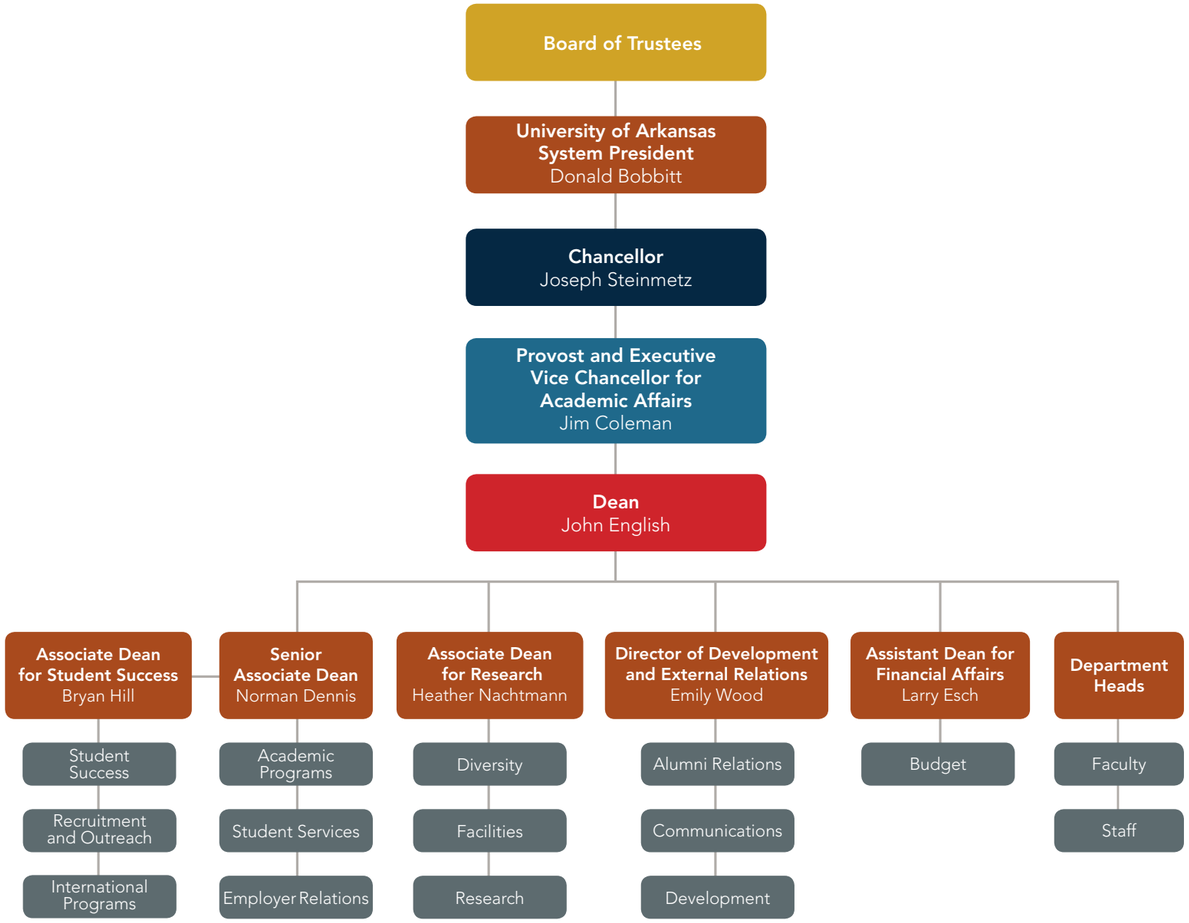
Fall 2018 Undergraduate Enrollment by Department



**Includes students not academically ready to pursue a major*

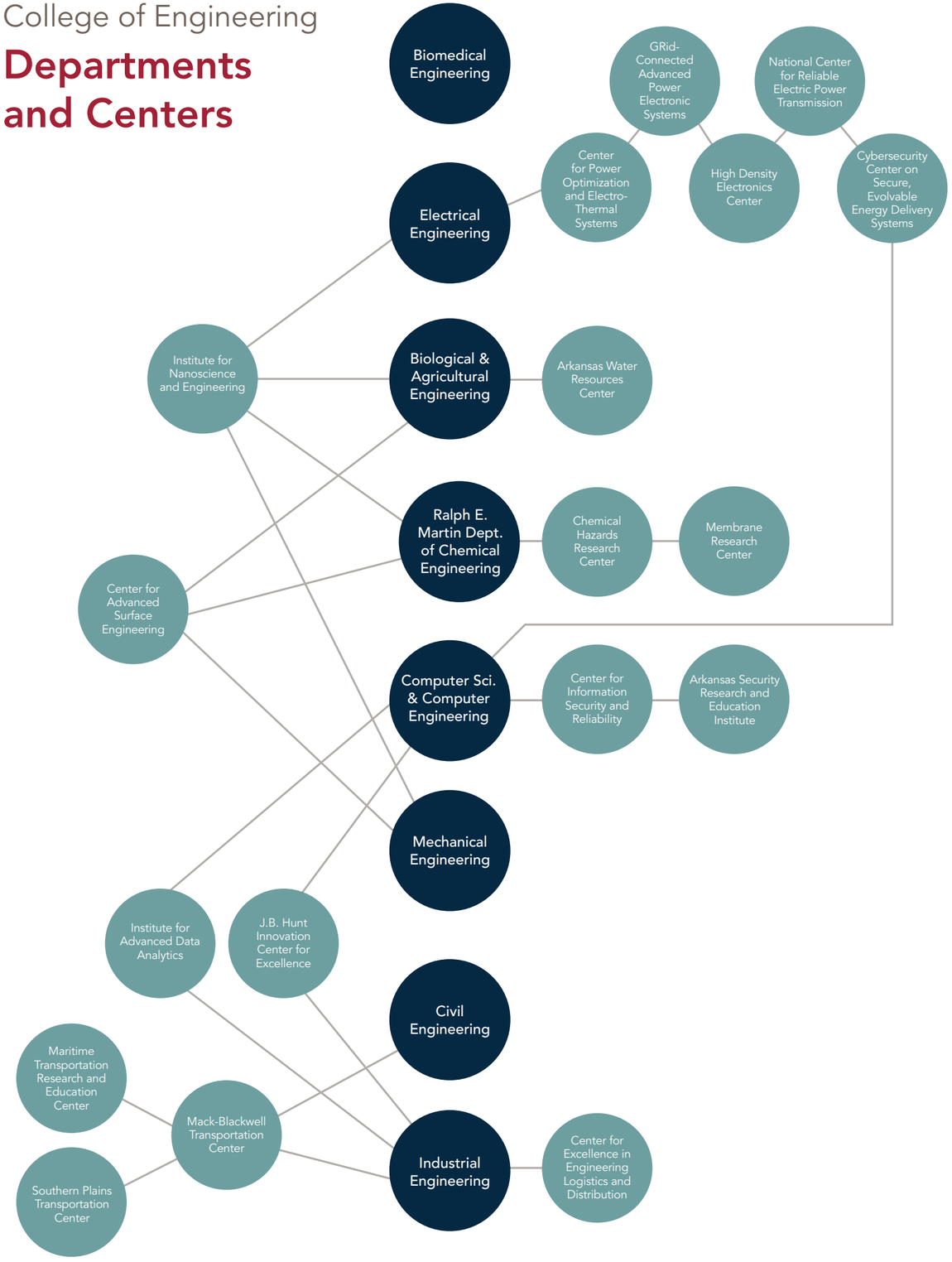
College of Engineering

Organization



College of Engineering

Departments and Centers



College of Engineering

Finances

Revenues (excluding gifts)

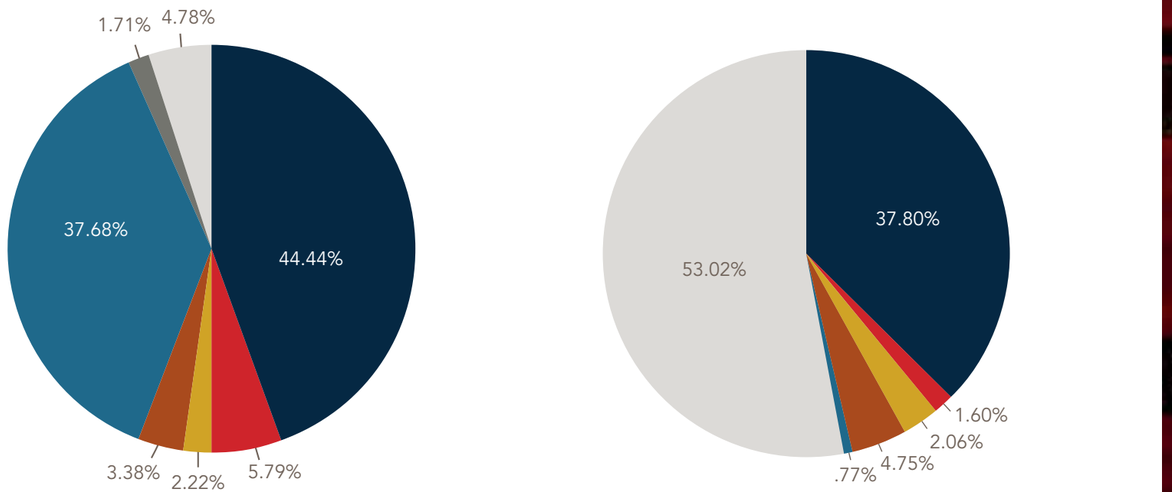
	2018
State Appropriations & Tuition	$25,976,864 44.44%
Distance Learning Revenues, Fort Smith, Service Centers, Conferences	$3,381,904 5.79%
Research Incentive Funds	$1,297,597 2.22%
Biological Engineering Teaching and Agricultural Experiment Station**	$1,974,884 3.38%
Sponsored Research (actual expenditures)*	$22,026,629 37.68%
Sponsored Activities and Scholarships (actual expenditures)	$1,002,185 1.71%
Student Equipment Fee Revenues (TELE-net)	$2,794,429 4.78%
Total	**$58,454,492**

**As reported to ASEE and USNWR*
***Cooperative Extension Service not included*

Expenditures (excluding gifts)

	2018
Salary and Benefits	$23,132,313 37.80%
Operating Expenditures	$980,572 1.60%
Dept. Restricted Fees/Misc.	$1,263,733 2.06%
Student Equipment Fees	$2,908,138 4.75%
Scholarships*	$468,273 0.77%
Research**	$32,452,297 53.02%
Total	**$61,205,326**

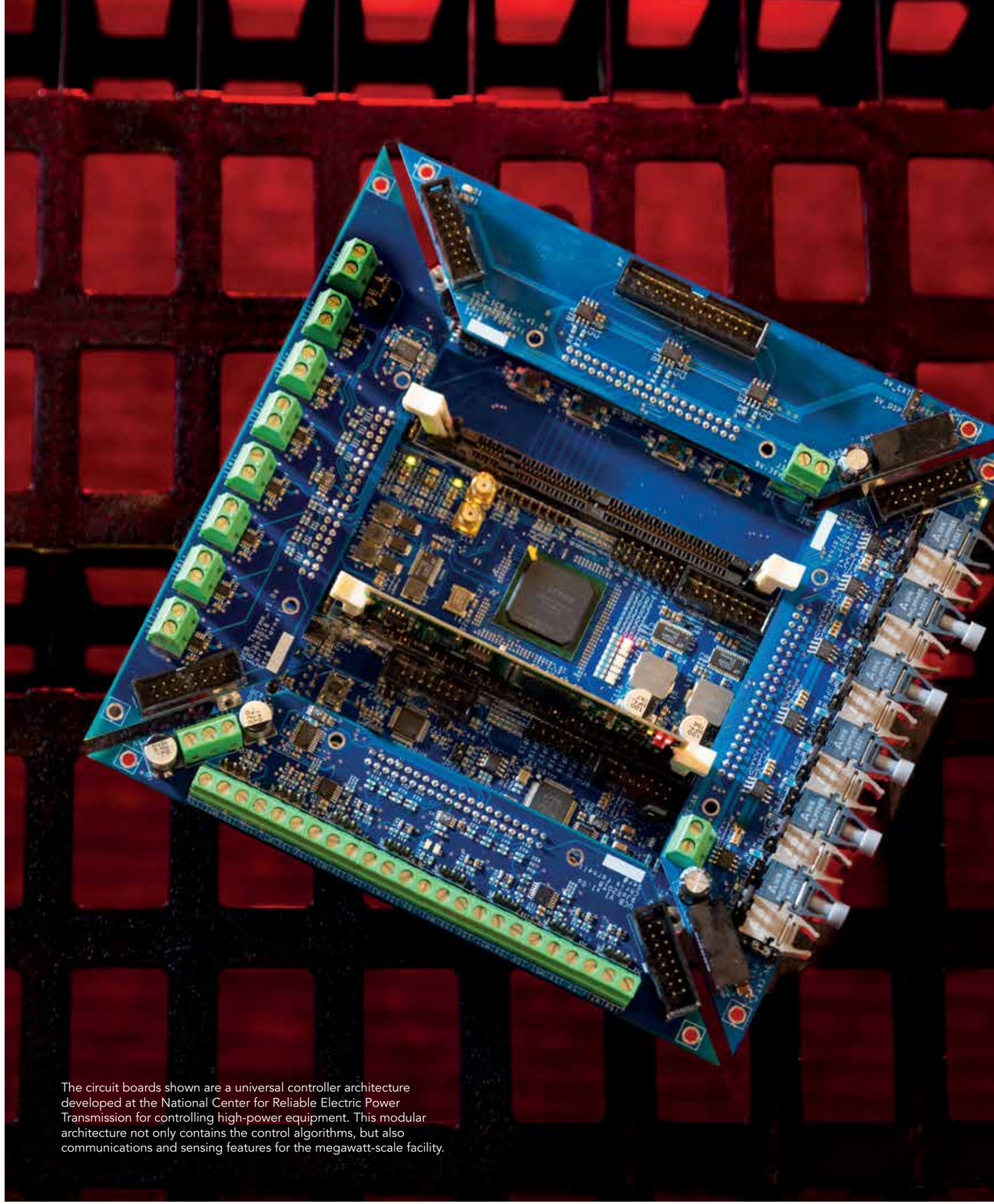
**Scholarships from state fund only*
***NSF expenditures report generated by Research Accounting*



- State Appropriations & Tuitions
- Distance Learning Revenues, Fort Smith, Service Centers, Conferences
- Research Incentive Funds
- Biological Engineering Teaching and Agricultural Experiment Station*
- Sponsored Research (actual expenditures)**
- Sponsored Activities and Scholarships (actual expenditures)
- Student Equipment Fee Revenues (TELE-net)

- Salary and Benefits
- Operating Expenditures
- Dept. Restricted Fees/Misc.
- Student Equipment Fees
- Scholarships
- Research***

**Cooperative Extension Service not included*
***As reported to ASEE and USNWR*
****Reported and compiled by the UofA Research Accounting Office and submitted to the NSF*



The circuit boards shown are a universal controller architecture developed at the National Center for Reliable Electric Power Transmission for controlling high-power equipment. This modular architecture not only contains the control algorithms, but also communications and sensing features for the megawatt-scale facility.

College of Engineering

Strategic Plan

Vision

Pursue excellence in research, scholarship and education, ensuring personal and professional growth for future generations of engineering leaders who will stimulate prosperity for Arkansas, the nation and the world.

Strategic Goals

- Recruit and graduate diverse, high-quality students
- Increase number and diversity of faculty and staff
- Support, recognize and reward faculty and staff excellence
- Increase research proposals and funding
- Build research and development culture
- Cultivate relationships with alumni and corporate partners
- Plan for infrastructure growth

Balanced Growth Metrics

- 3,500 undergraduate students
- 1,000 master's students
- 350 doctoral students
- 135 tenured and tenure-track faculty members
- 65 clinical and research faculty members
- 180 staff members
- $300,000 in research expenditures per faculty member

Objectives	Increase Student Quality and Diversity	Provide Student-Centered Education	Recruit and Retain High-Quality Faculty and Staff	Increase Research Productivity	Increase Economic Development	Increase Alumni and Corporate Partnerships	Provide High-Quality Infrastructure
Metrics	▸ ACT and GRE quantitative scores ▸ Career placement rate ▸ Graduate student acceptance rate ▸ Honors student completion rate ▸ Student diversity	▸ Experiential learning participation ▸ First-Year retention rate ▸ Six-year undergraduate graduation rate ▸ Student-faculty ratios ▸ Student semester credit hours per FTE ▸ Undergraduate degrees awarded	▸ Faculty retention ▸ National awards ▸ Professional society leaders and fellows ▸ National Academy of Engineering membership ▸ Staff-faculty ratios ▸ Faculty diversity	▸ Doctoral and master's degrees granted ▸ New research grants received ▸ Peer-reviewed publications ▸ Research proposals submitted ▸ Research expenditures (total and per faculty)	▸ Invention disclosures ▸ Industry research expenditures ▸ Patents awarded ▸ Startup companies	▸ Philanthropic giving ▸ Endowed faculty positions ▸ Endowed scholarships and fellowships ▸ Percentage of alumni who give	▸ Academic space ▸ Research space ▸ Renovated space ▸ Renovation investment

Preparing You for Your Tomorrow

College of Engineering

Balanced Growth

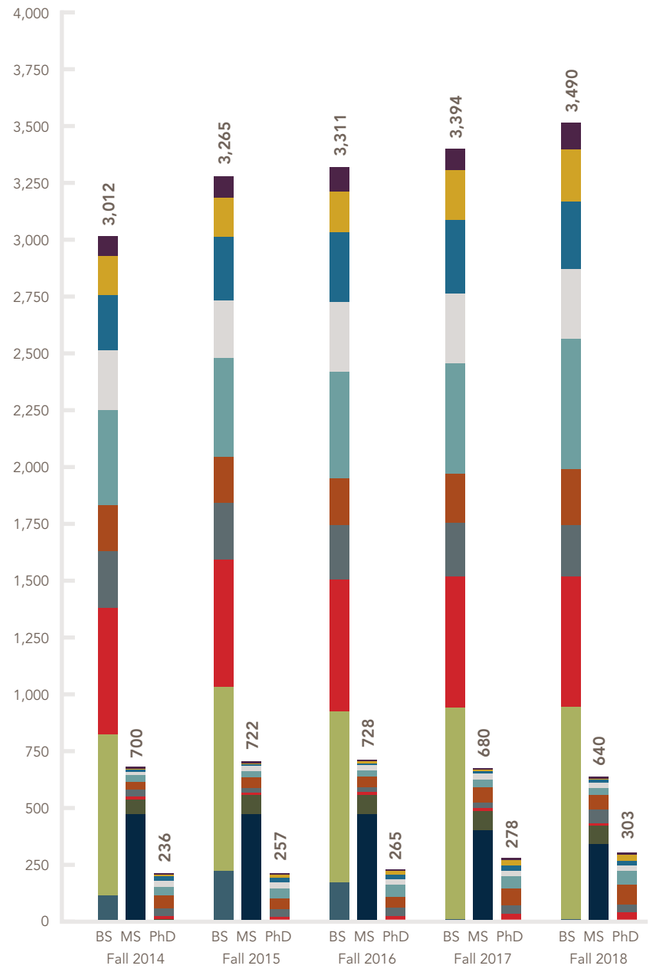
RACHEL HOLMER

B.S.I.E. 2018
College of Engineering
Outstanding Senior

"The University of Arkansas College of Engineering had such an impact on the trajectory of my life, academic and beyond. Throughout the course of four years, leadership roles, volunteer activities and challenging courses have matured me and prepared me for a future career. The College of Engineering puts so much into their students, and I was honored to be presented with so many opportunities for growth while in school. My time with Alpha Pi Mu, the industrial engineering honor society, helped me to develop better engagement skills. When in leadership positions, I learned it is so important to include those around you, and by communicating with faculty and students for events, I was able to develop some really amazing relationships.

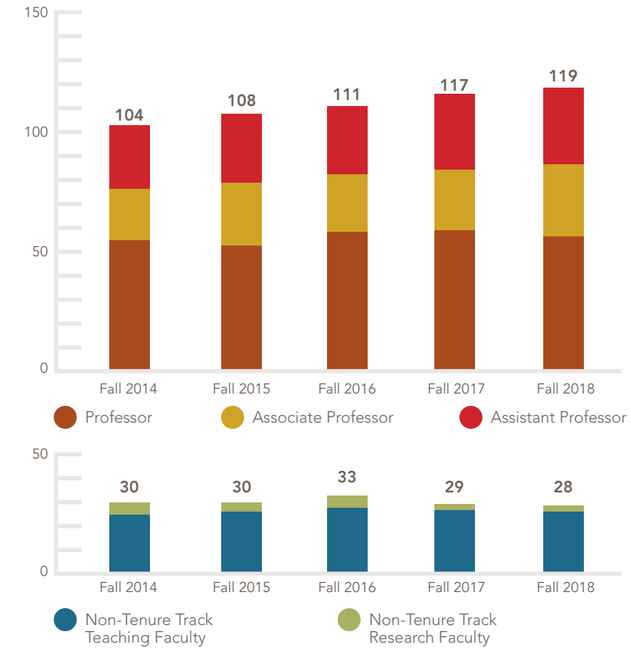
Junior year I was able to travel to Delhi, India for a conference. I found it really encouraging that the college saw the value in what I was researching enough to fly me around the world to present. I was reminded again, after first realizing while studying abroad in Madrid, Spain, traveling abroad really forces you to get out of your comfort zone and understand how complex and exciting the world is. These realizations resulted in me deciding to study business analytics, which I will do for the next year at MIT. I hope to enter the workforce next year and help develop solutions to some of society's leading issues through the use of data and data-based decision-making. The College of Engineering challenges its students in so many ways, and we all graduate better humans because of it."

Enrollment by Department*

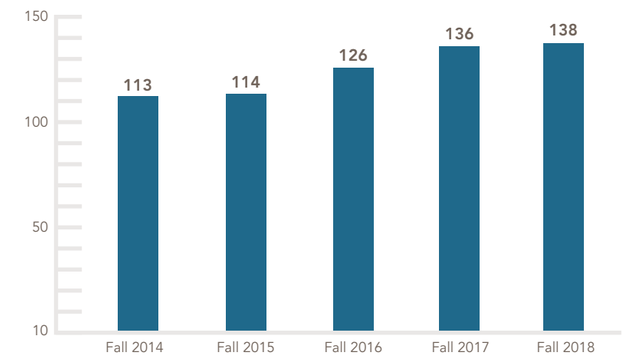


Interdisciplinary students are included in the department of their faculty advisor.

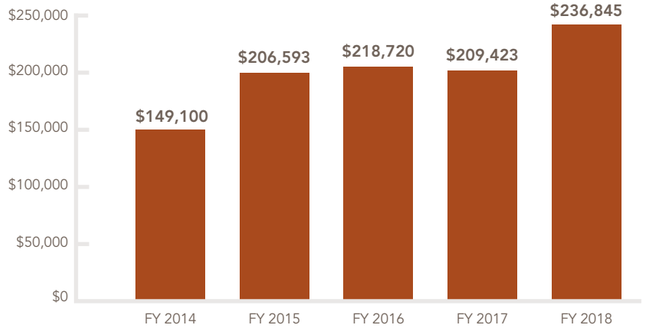
Faculty by Rank



Total Staff



Research Expenditures per Faculty



Balanced Growth Goals

3,500
undergraduate students

1,000
master's students

350
doctoral students

135
tenured and tenure-track faculty members

65
clinical and research faculty members

180
staff members

$300,000
in research expenditures per faculty member

College of Engineering

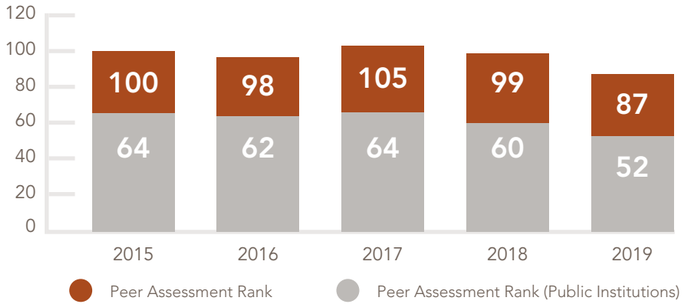
Balanced Growth

NORMAN DENNIS

Senior Associate Dean,
University Professor of
Civil Engineering

"Our students graduate into a rapidly changing world, and making sure they're ready for it is our top priority. Whether our graduates enter the workforce or stay in academia, we're focused on equipping them with the disciplinary technical skills and instilling in them the capacity and willingness to innovate and collaborate with peers in engineering, business and beyond. College of Engineering students have a unique opportunity to work alongside professionals at some of the world's biggest companies, and many of those relationships that begin as student projects or internships turn into future jobs."

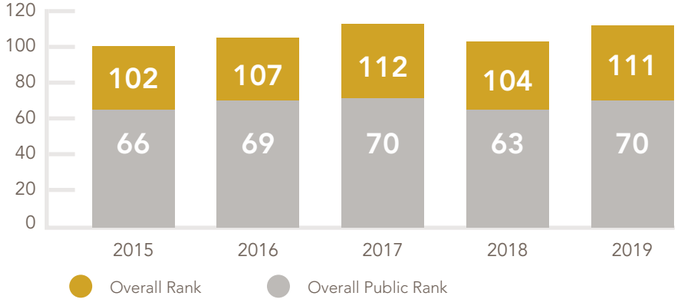
Undergraduate Ranking



Undergraduate Peer Assessment Score

2015	2016	2017	2018	2019
2.4	2.4	2.5	2.6	2.6

Graduate Ranking



Academic Reputation Score (out of 5.0)

2015	2016	2017	2018	2019
2.3	2.3	2.3	2.3	2.3

Non-academic Reputation Score (out of 5.0)

2015	2016	2017	2018	2019
2.6	2.6	2.7	2.8	2.7

Collin Burris, computer engineering major, Sarah Hernandez, assistant professor of civil engineering, and Magdalena Asborno, civil engineering doctoral candidate, are pictured next to a prototype Lidar sensor. The low-cost sensor is capable of classifying trucks by body configuration (e.g. van, tank, platform, intermodal container, etc.), providing critical information for freight flow forecasting. Such forecasts are carried out by the public sector to determine which transportation projects to prioritize for investment.

U.S. News & World Report How Rankings Are Measured

U.S. News and World Report, a popular source of university rankings, ranks both undergraduate and graduate programs.

For Ph.D. programs, it considers metrics related to the quality of students the college attracts and metrics related to graduates' achievements.

U.S. News also surveys deans, program directors, senior faculty and professionals who hire engineering graduates to establish peer and corporate recruiter assessment data. For its college undergraduate rankings, U.S. News uses only peer assessment data. The 2019 rankings are based on a two-year average of data from 2016 and 2017.

Graduate Rankings Metrics:

Quality assessment:

Peer assessment **25%**

Corporate recruiter assessment **15%**

Student selectivity:

Mean GRE quantitative score **6.75%**

Graduate acceptance rate **3.25%**

Faculty resources:

Student-to-faculty ratio - Ph.D. **7.50%**

Student-to-faculty ratio - M.S. **3.75%**

Percent of faculty in the National Academy of Engineering **7.50%**

Doctoral degrees awarded **6.25%**

Research activity:

Total research expenditures **15%**

Average research expenditures per faculty member **10%**

Look for this icon throughout the book. It indicates metrics that directly affect our U.S. News and World Report ranking.

JOSEPH DANIELS III

Doctoral Candidate
Civil Engineering

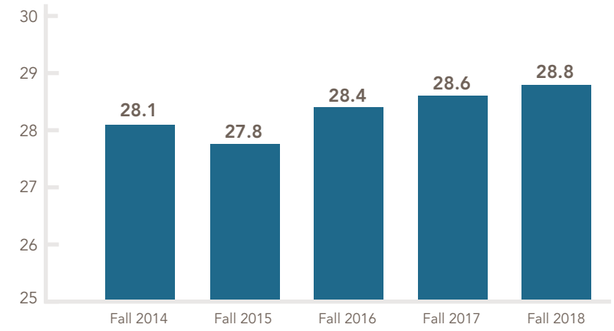
Joseph Daniels III is developing an anti-icing pavement system designed to improve airfield safety during extreme weather. The system aims to use renewable solar energy to lower operational costs of heating surfaces to prevent flight delays, cancellations and potential accidents. The idea is to incorporate wiring into concrete, then use solar energy to power the transfer of heat through the wires to warm the pavement.

He has been honored by U.S. Department of Transportation Secretary Elaine Chao with the Recognizing Aviation and Aerospace Innovation in Science and Engineering award (RAISE), which recognizes innovative scientific and engineering achievements that will have a significant impact on the future of aerospace or aviation.

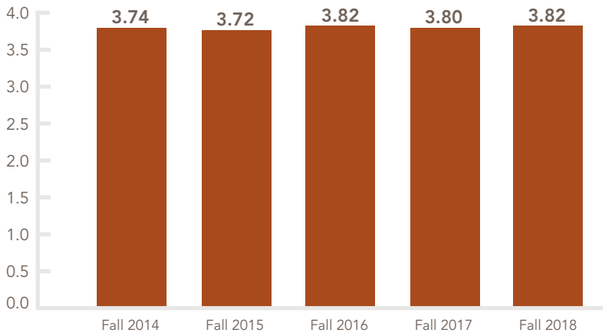
Accolades are not new for Daniels. He was awarded the Department of Transportation's Dwight David Eisenhower Graduate Fellowship in 2015, 2016 and 2017, presented a talk at a TEDx event in 2016 and was selected to present his research at the Transportation Regional Board conference in 2017.

A native of Silver Spring, Maryland, Daniels earned a bachelor's degree in civil engineering at North Carolina A&T State University.

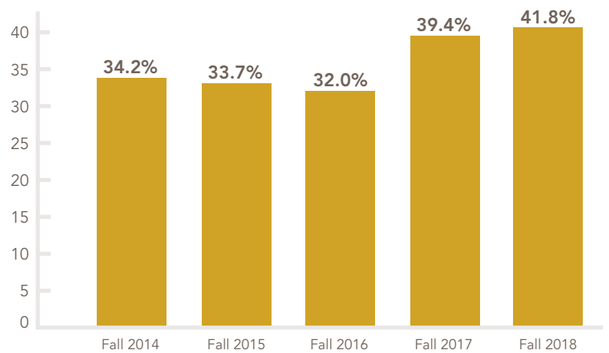
First-Year ACT Average



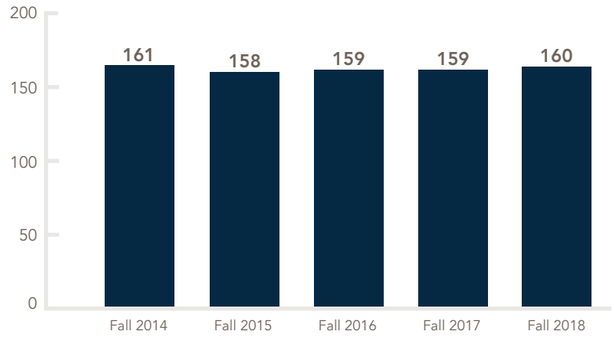
First-Year Mean Highschool GPA



Graduate Acceptance Rate



Mean GRE Quantitative Score*



*Does not include distance students

Preparing for Tomorrow

We continue our outreach to Arkansas K-12 schools with increasingly excellent STEM programming to interest young people in engineering careers and to enhance the number of students pursuing STEM disciplines.

We are creating more endowed scholarships to support engineering undergraduates who have financial need.

We are increasing scholarships for students who display exceptional leadership and academic qualities.

We are establishing more graduate endowments to recruit exceptional graduate students and provide our faculty with excellent assistants to their research.

BRYAN HILL

Associate Dean for Student Success

"The field of engineering is evolving quickly, and the College of Engineering plays a critical role in broadening the workforce in our state and around the world. The College is enrolling more female and minority students than ever before, ensuring the growing workforce is representative of the diversity of the state.

We are also committed to growing our doctoral student enrollment. These students are the backbone of the College's research mission, assisting faculty members as they pursue solutions to the largest challenges facing the world today.

Ultimately, graduating students is our core mission. Student success is at the front of everything we do. Our greatest responsibility is to ensure Arkansas students at all levels have the support they need to be successful in the classroom, the research lab and in their lives."

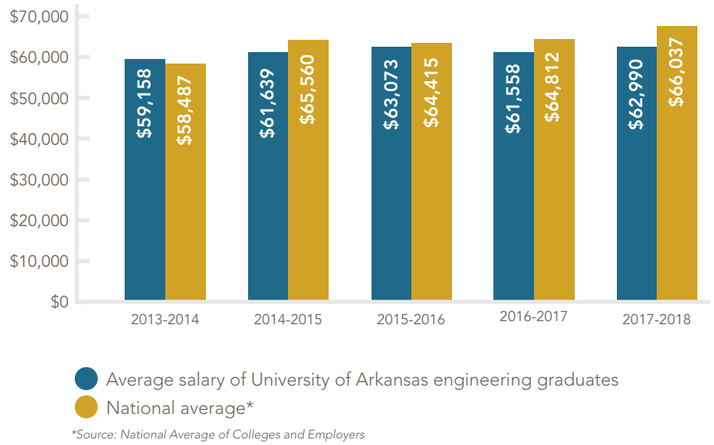
MIRIAM GONZALEZ

Chemical Engineering Student

"Being a first-generation Latina student, I wasn't sure what to expect when I came to the University of Arkansas and the Engineering Career Awareness Program gave me the support system I needed. As part of ECAP, I attended a summer bridge program before my freshman year and got to meet the other students in my cohort. Over the summer, we got the opportunity to bond and it was such a relief walking into classes on the first day and having familiar faces to sit next to.

ECAP is more than just a program, it truly is a family. We all support one another and want each other to succeed. It has given me mentors, a network of alumni and endless opportunities throughout my undergraduate career. I am truly thankful for this family."

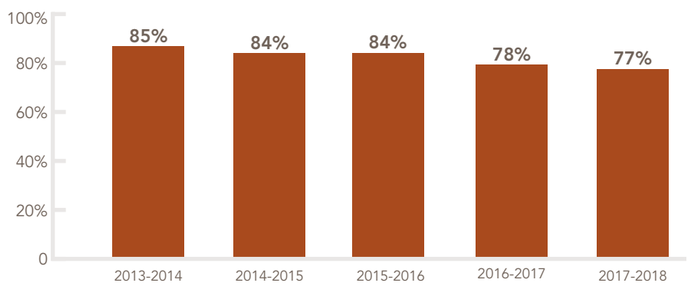
Engineering Graduate Average Starting Salaries



*Source: National Average of Colleges and Employers

Engineering Graduate Placement Rate*

(percentage of graduates employed or attending graduate school)



*Self reported percentage of students graduating who were employed as engineers or attending graduate school within three months of graduating.

Fall 2018 Incoming Student Awards

5	30	134	23
Bodenhamer Fellows	Honors College Fellows	Chancellor Scholars	Merit Scholars

Number of Honors Graduates

2014	2015	2016	2017	2018
62	62	92	67	85

Recipients of Nationally Competitive Awards and Scholarships

	2014	2015	2016	2017	2018
National Science Foundation Graduate Research Fellowship	8	1	2	2	3
NSF GRF Honorable Mention	3	3	1	3	4
Goldwater Scholarship	1		1	1	1
Goldwater Honorable Mention		2	1		
Truman Scholarship			1		
Whitaker Fellowship	1				
NSF CyberCorps Scholarship for Service	1				
Udall Scholarship		1			1
Schwarzman Scholar				1	
DAAD Research in Science and Engineering Award					1
3M GEM Fellowship					1
Critical Language Scholarship					1
Fulbright English Teaching Assistantship					1

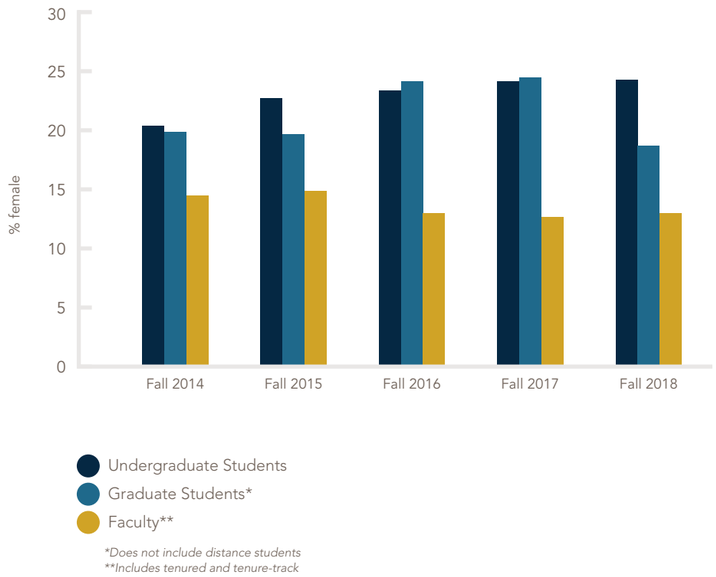
DRAKE MALTOS

Computer Science and Computer Engineering Student

"The Engineering Career Awareness Program (ECAP) was the driving factor behind my interest in studying engineering at the University of Arkansas. Coming from a small, rural background, I knew that I had the odds against me when compared to some of my peers. I also knew that I was coming into a new area without knowing anyone around me. Thanks to ECAP, I was welcomed into a group of high-achieving and inclusive peers who all walked similar paths to the one I was on. Due to this, and our summer bridge program that took place before freshman year, I made friends with students who I not only took classes with, but also developed personally alongside.

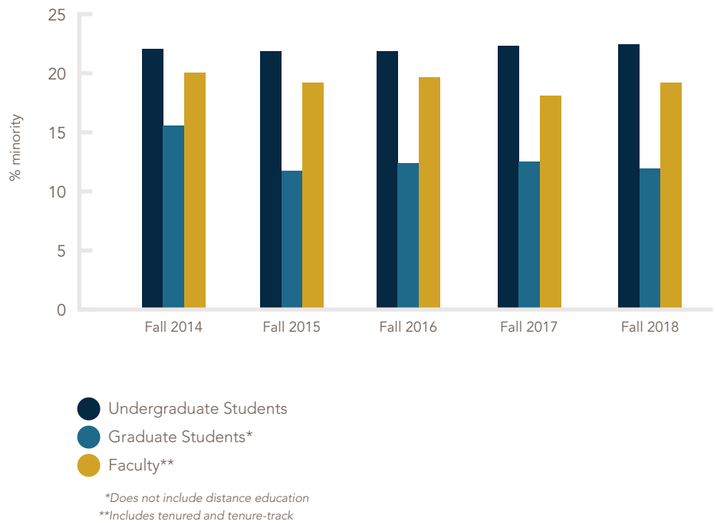
I can confidently say that without ECAP, I would not be where I am today. The knowledge I've learned throughout the years from ECAP is priceless, the wisdom I've gained is powerful, and the connections I've made, both with my peers and alumni, will last a lifetime. ECAP truly exemplifies what it means to have a second family away from home, and going forward, no matter what success I may encounter, I will always dedicate it to my involvement in this program."

Gender Diversity



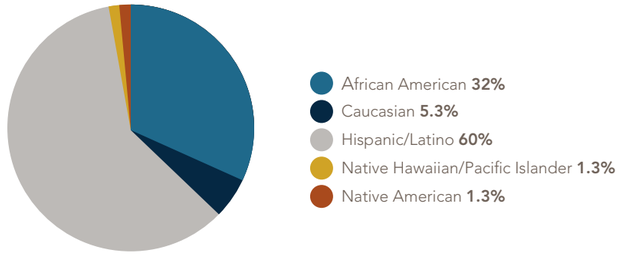
*Does not include distance students
**Includes tenured and tenure-track

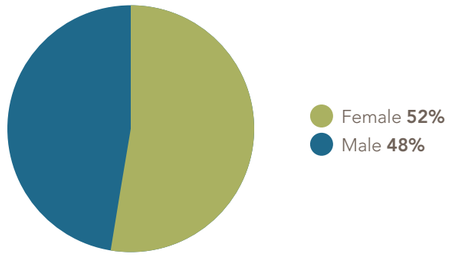
Underrepresented Minority Diversity



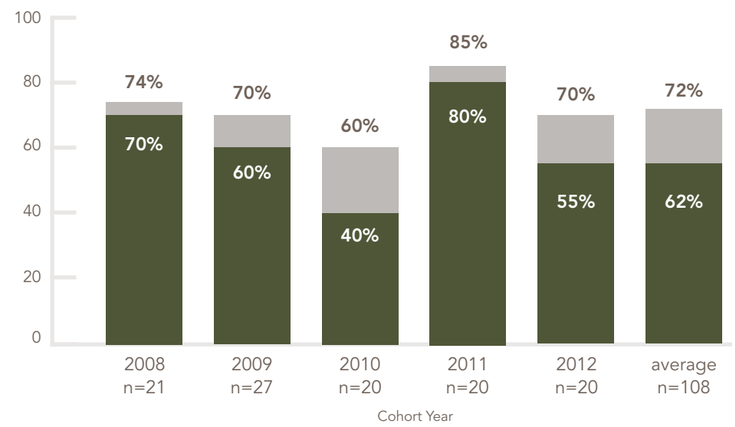
*Does not include distance education
**Includes tenured and tenure-track

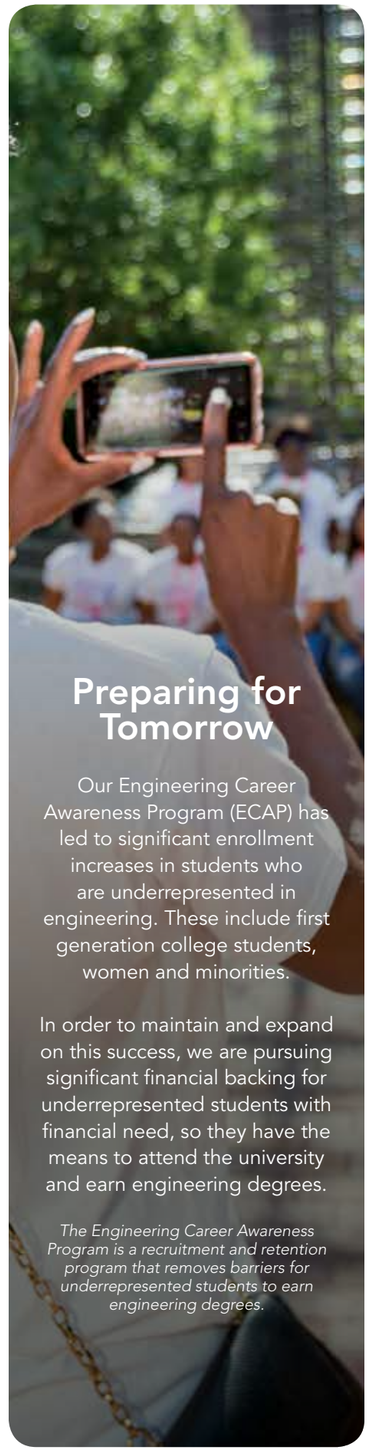
Engineering Career Awareness Program Student Demographics





Engineering Career Awareness Program– Six-Year Graduation Rates





Preparing for Tomorrow

Our Engineering Career Awareness Program (ECAP) has led to significant enrollment increases in students who are underrepresented in engineering. These include first generation college students, women and minorities.

In order to maintain and expand on this success, we are pursuing significant financial backing for underrepresented students with financial need, so they have the means to attend the university and earn engineering degrees.

The Engineering Career Awareness Program is a recruitment and retention program that removes barriers for underrepresented students to earn engineering degrees.

OLIVIA OVERTON

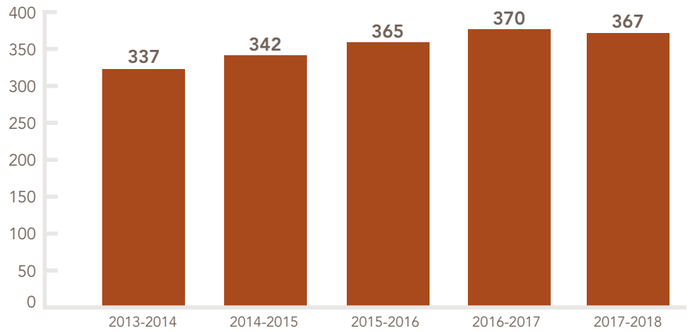
First-Year Engineer of the Year

"I chose to study engineering because I loved my math and science classes in high school, and I knew I wanted a career where I felt I could make a difference in the world. During my first year, I realized with a degree in Civil Engineering I could combine my love of math and science with my interest in improving the environment.

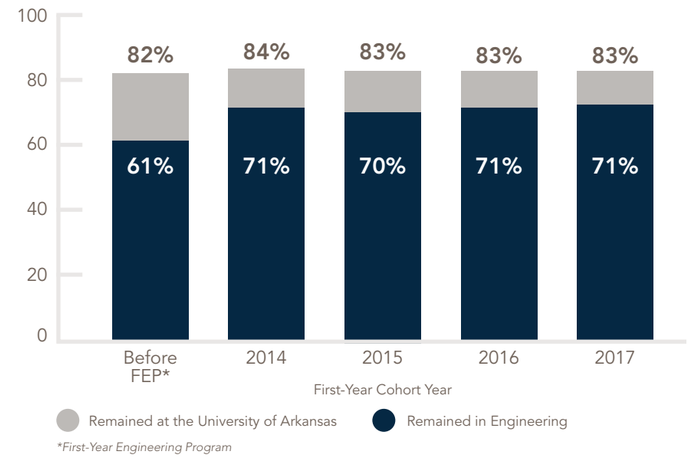
Both of my parents and several members of my family graduated from the University of Arkansas, so I always considered attending the University of Arkansas. However, I did not make my final decision until after I visited the campus as a high school senior. I immediately liked the campus atmosphere and loved the beauty of the campus, and I appreciated the numerous research and career opportunities available to University of Arkansas students. Attending the University of Arkansas was the right choice for me."

Experiential Learning

(Students who participated in cooperative education, undergraduate research or study abroad)

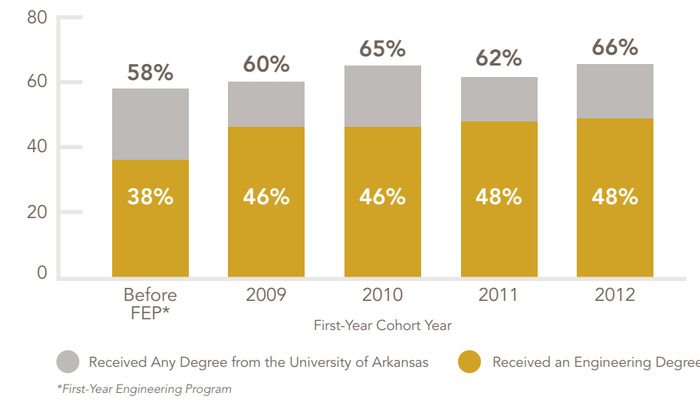


First-Year Retention Rate



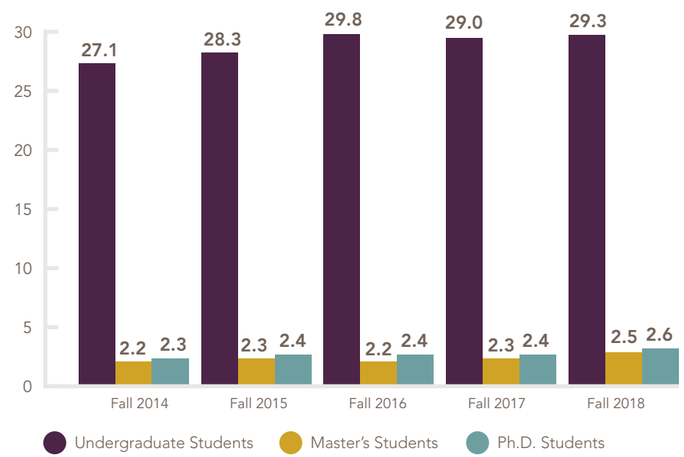
*First-Year Engineering Program

Six-Year Graduation Rate

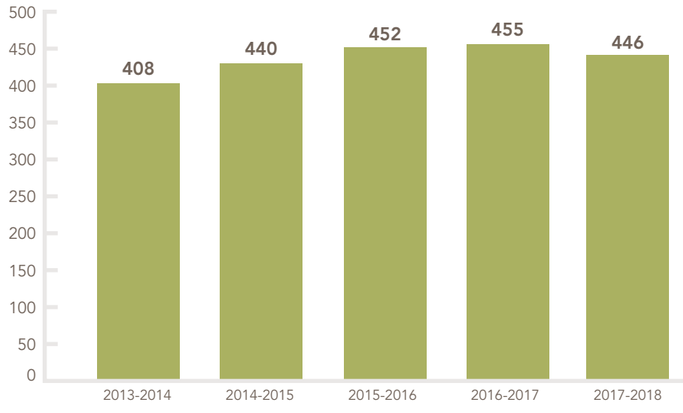


*First-Year Engineering Program

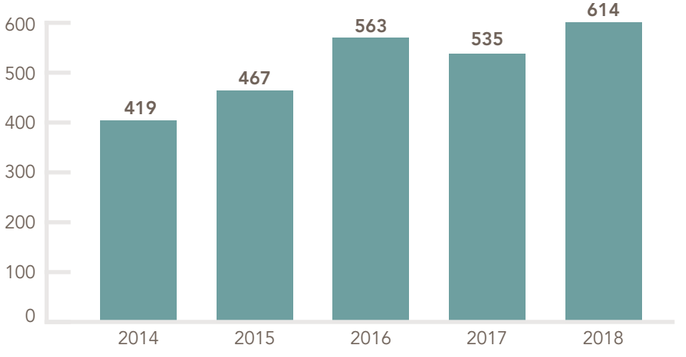
Student-Faculty Ratios



Student Semester Credit Hours per Faculty Full Time Equivalence



Bachelor's Degrees Awarded



Preparing for Tomorrow

In order to cement our success in retaining and graduating engineers, we are seeking to endow the First-Year Engineering Program so that it is assured support in perpetuity.

We plan to continue to connect successful alumni with our students through classroom presentations, mock interviews, industry visits and other activities.

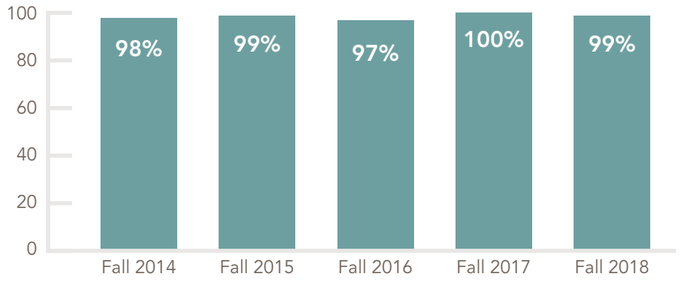
KEVIN HALL
Professor of Civil Engineering,
Walter E. Hicks and Blossom
Russell Hicks Professorship for
Infrastructure Engineering
Dean's Award for Excellence for Outstanding Public Service

Kevin Hall is a world-renowned expert on asphalt materials and pavement performance and serves a variety of technical groups focused on ways to advance the deployment of new technologies. He is active in numerous capacities with the American Society of Engineering Education, serving as director, program chair and vision chair over the past several years.

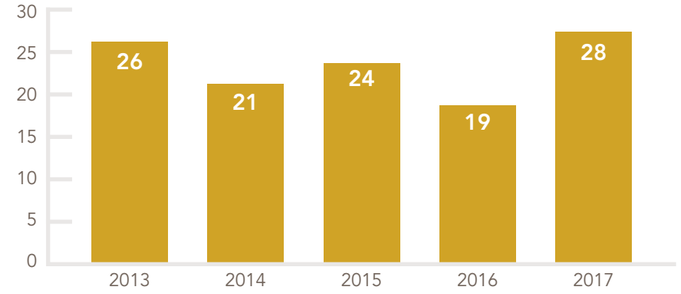
ED CLAUSEN
Associate Department Head and
Professor, Ralph E. Martin Department
of Chemical Engineering
John Imhoff Award for Teaching

Ed Clausen's dedication to teaching shines through not only in his stellar evaluation numbers, but also through his dedication to mentoring the next generation of K-12 teachers and university faculty. He teaches one of the most heavily-subscribed introductory courses in chemical engineering, and his natural, easy way of interacting with students allows him to effectively guide them through even the most difficult material. Outside the classroom, Ed is a leader in a state-supported College of Engineering program to train public school teachers to integrate critical thinking skills and inquiry-based learning into their curriculum.

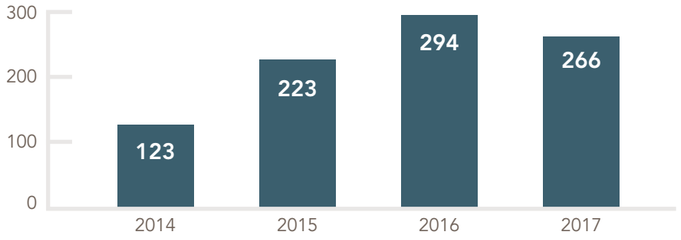
Faculty Retention



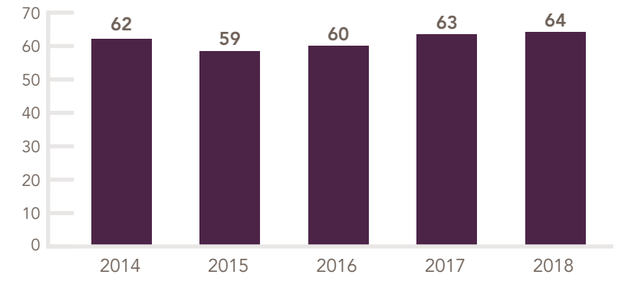
National Faculty Awards Received



Professional Service Leadership
(number of external leadership positions held by faculty)



Society Fellows*

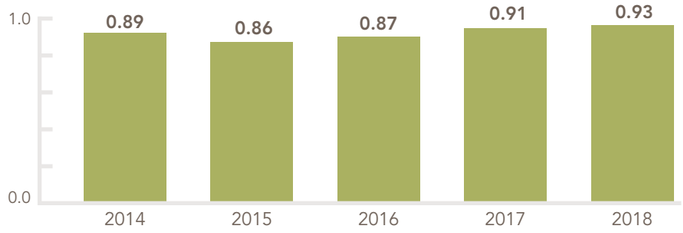


For a complete list of Fellows, see Appendix page 39

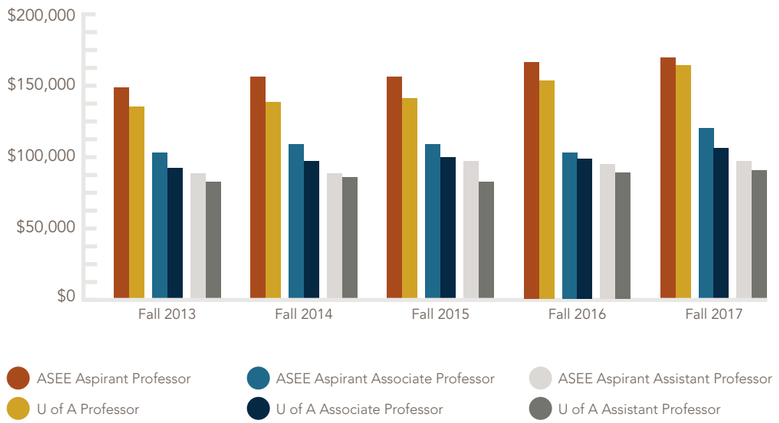
Membership in the National Academy of Engineering

2014	2015	2016	2017	2018
2 members	2 members	2 members	2 members	3 members

Staff-Faculty Ratio



U of A and American Society for Engineering Education (ASEE) Average Faculty Salary Comparisons*



**ASEE salary survey data for fall 2018 is not available until January. Instructor salaries are not benchmarked in the ASEE salary survey.*

BEN RUNKLE
Assistant Professor, Biological
and Agricultural Engineering
Dean's Award for Excellence for Rising Teaching

Ben Runkle's success in teaching comes from his ability to connect students with real-world examples throughout their coursework, his willingness to adjust his teaching based on student feedback, and his willingness to share his own research interests with students. He is also engaged in one-on-one mentoring of several students, and uses the connections he has established through his research to integrate both graduate and undergraduate students into the broader scientific community.

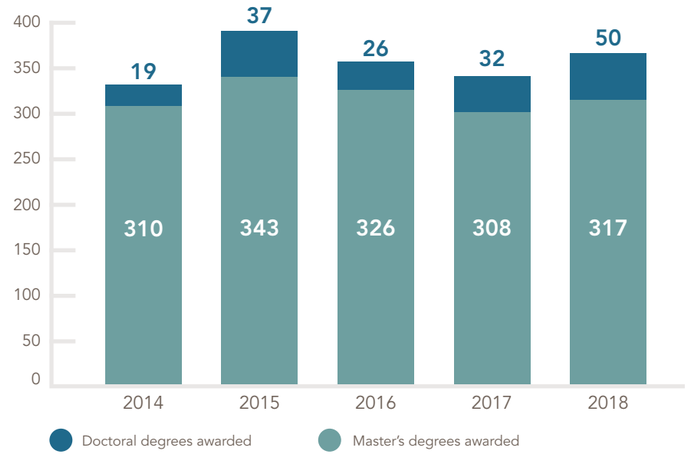
MIN ZOU
Professor, 21st Century Professorship,
Mechanical Engineering
John L. Imhoff Award for Research

Min Zou is an internationally-recognized expert in tribology, with specific applications at the nano scale. She is a fellow of the Society of Tribologists and Lubrication Engineers, where she also serves on the board of directors. Min has been the lead PI or Science PI on almost all of her 12 external grants funded by Ford Motor Company, NASA, the Department of Energy, the National Science Foundation, the Arkansas Biosciences Institute and the Arkansas Department of Higher Education. She has been awarded more than three million dollars in research funding, plus 24 million for the Center for Advanced Surface Engineering, a multi-university and multi-institution research center.

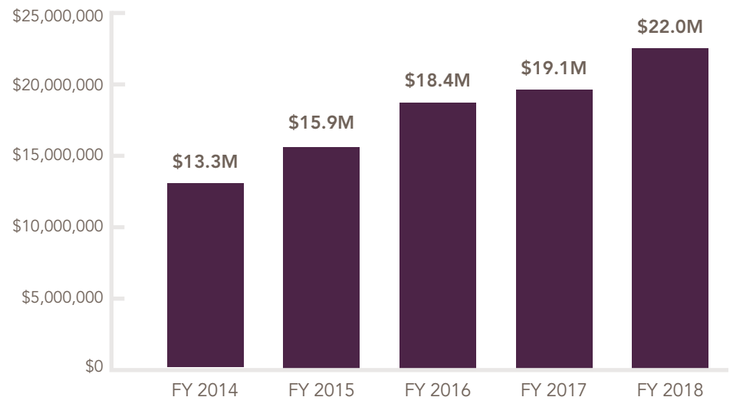
HEATHER NACHTMANN
Associate Dean for Research,
Earl J. and Lillian P. Dyess Endowed Chair in Engineering,
Professor of Industrial Engineering

"University research has a tremendous impact on society and the economy in the state of Arkansas and around the world. Our researchers work every day to improve the quality of our lives and discover and develop new science and technologies that will shape our future. Our college's growth in research activity, scholarly work, industry funding, and invention disclosures demonstrates the success of our faculty in attracting research funding and transferring resulting technologies. The future of our college also looks bright with seven of our assistant professors receiving Faculty Early Career Development (CAREER) Awards from the National Science Foundation this year. We are very proud of the research accomplishments of all of faculty as they change the world while teaching and mentoring our next generation engineers."

Advanced Degrees Awarded

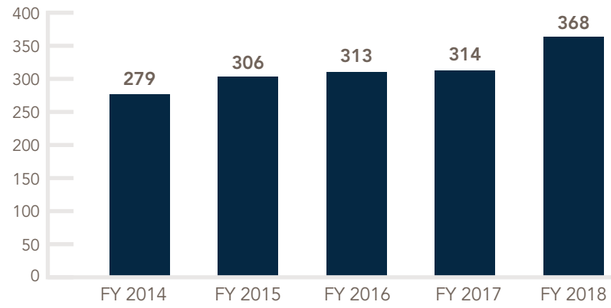


Total Research Expenditures*

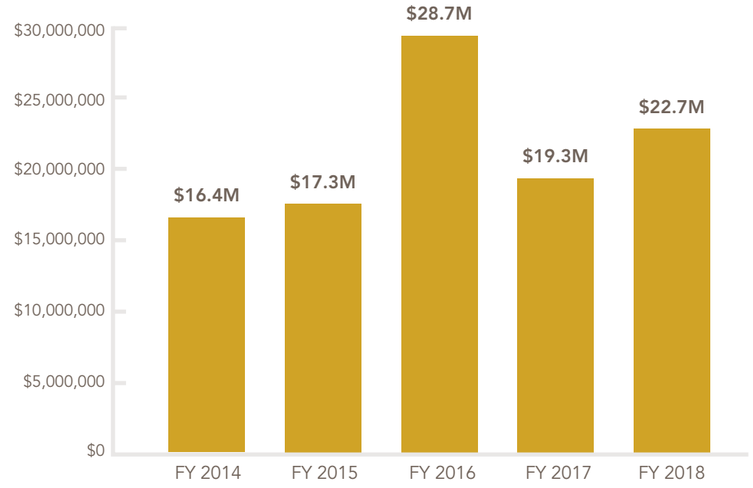


*As reported to ASEE/USNWR

Research Proposals Submitted



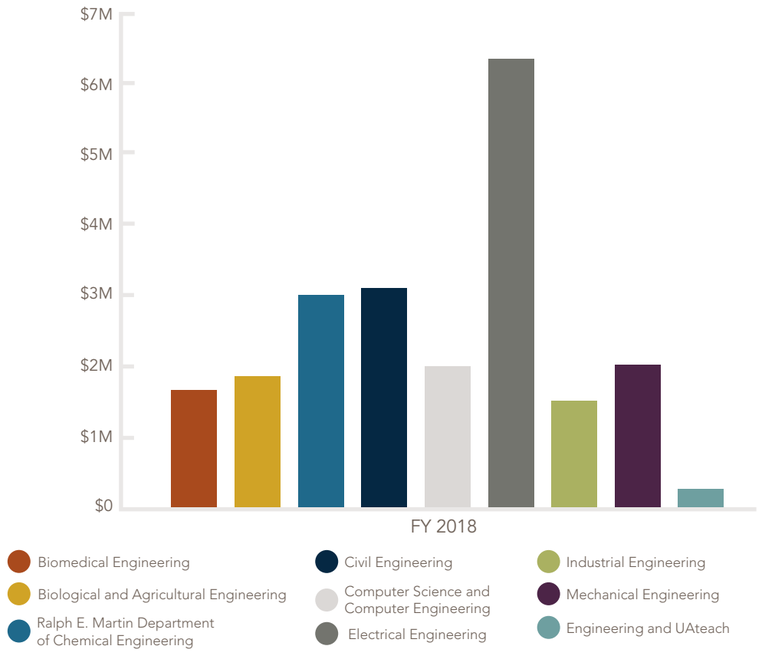
Research Grants Awarded



Peer-Reviewed Publications

2014	2015	2016	2017
397	402	455	515

Research Expenditures by Department



PAUL MILLETT
Assistant Professor,
Mechanical Engineering
Rising Star Faculty Research Award

During his time at the university, Paul Millett has distinguished himself as both a researcher and in his teaching practice. He has published 22 papers in his field, been a lead PI on 1.4 million dollars in grants, and was a co-PI on a 20-million dollar grant for the Center for Advanced Surface Engineering. Paul's scholarly work is highly regarded by his peers, and he is a peer reviewer for multiple leading technical journals and proposal panels.

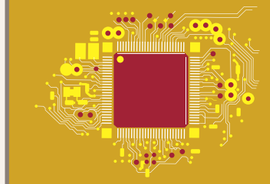
CHASE RAINWATER
Associate Professor,
Industrial Engineering
Collaborative Faculty Research Award

Chase Rainwater has a sustained record of active collaborations both within and outside the college, and he has received praise from collaborators, students and superiors for his collegial approach to research. He has collaborated with 27 different faculty members from 11 different disciplines while pursuing external funding. His collaborators come from 11 universities, four companies and two federal agencies, resulting in nearly seven million dollars in funding. His ability to collaborate also extends to his scholarly publications. He has co-authored 12 papers in 9 journals, with 19 different individuals, as well as co-editing a book alongside 3 University of Arkansas Food Science faculty members.

University of Arkansas College of Engineering

RESEARCH STRENGTHS

FACULTY DEPARTMENTS CENTERS



Electronics

The College of Engineering has been producing graduates focused on electronics for over 30 years. Researchers in this area are developing new materials for circuits and photovoltaic cells, designing and modeling circuits, creating packages that protect and integrate electronic devices and creating and testing new technologies to improve our power grid.

- Research centers predominately working in this area include the Center for Power Optimization of Electro-Thermal Systems, GRid-connected Advanced Power Electronics Systems (GRAPES), High Density Electronics Center (HiDEC) and the National Center for Reliable Electric Power Transmission (NCREPT)
- Approximately $4 million per year in research expenditures
- Several startup companies have emerged from this area

Energy

The broad area of energy has a foundation in electronics, but has expanded to include power systems, energy storage, smart grid innovation, biofuels and oil and gas research. As the world struggles to find and integrate safer and more sustainable sources of energy, research in this field is more important than ever.

- The Cybersecurity Center for Secure Evolvable Energy Delivery Systems (SEEDS) along with GRAPES and NCREPT contribute to the college's annual research expenditures of $4 million
- Energy research in the college is supported by the National Science Foundation, Department of Energy and Department of Defense
- Tech transfer of this research is making significant contributions to the college's public and private energy partners

Biomedical and Healthcare Engineering

College of Engineering research encompasses both technological and biological investigations in biomedical and healthcare engineering. Many life-enhancing breakthroughs in medicine and healthcare delivery result from research combining engineering and the medical sciences, including biomechanics and mechanobiology, biomaterials, cell and tissue engineering, healthcare logistics and medical decision making.

- The college conducts approximately $2 million in annual research expenditures in this area including work done by the Membrane Research Center
- This is one of our most collaborative research areas with faculty from all eight departments working together to obtain funding from health agencies including the National Institutes of Health
- Researchers in this area collaborate with industry and healthcare providers to improve health and wellness throughout Arkansas and the U.S.

EXISTING STRENGTHS

In January 2014, a research task force appointed by Dean John English identified existing and emerging strengths in the college. Existing strengths are those areas where the college is already nationally recognized. Emerging areas are fields where the college has some key presence, expertise and momentum. These are expected to emerge into strengths with additional investment. The full report can be found at engineering.uark.edu.

Materials Science and Engineering

Our college's innovations in materials science and engineering lead to improved materials to solve technological and societal problems. Our research activities include advanced materials for packaging, control analysis, high resolution and device characterization, advanced coatings and surface engineering, photovoltaic materials, thermoelectric materials, nanotribology and bioinspired functional surfaces and materials.

- Materials research is conducted at the Center for Advanced Surface Engineering and Institute for Nanoscience and Engineering which are supported by micro-fabrication at HiDEC and in labs throughout the college
- Annual research expenditures in this area approach $2 million
- Several startup companies were created such as the award-winning NanoMech and SurfTec demonstrating successful tech transfer in this area

Transportation and Logistics

The College of Engineering has been a national leader in transportation and logistics for more than twenty years. Researchers are looking at distribution, transportation, information technology and software solutions, and maritime and multimodal transportation.

- The Mack-Blackwell Transportation Center and Center for Excellence in Logistics and Distribution (CELDi) have been at the fore-front of research in this area for two decades
- Annual research expenditures in this area consistently exceed $3 million
- The college works closely with the Arkansas and U.S. Departments of Transportation and many other transportation stakeholders across the nation

EMERGING AREAS

Aerospace
The U of A is moving to respond to this area, which is the single largest export market from the state of Arkansas.

Big Data/ Data Analytics
Technology has increased the amount of data we produce, leading to an increased need to analyze this data.

Cybersecurity
Researchers are looking at increasing digital security and information assurance, especially in the areas of transportation and the power grid.

Infrastructure
As a land-grant institution, the U of A has a responsibility to maintain the nation's water and electric resources, communications and transportation.

Advanced Manufacturing
Keeping manufacturing jobs in America and maintaining our competitiveness in this area is key for economic growth.

Optoelectronics
This field is emerging from the broader field of electronics. It involves new semiconductor materials, biophotonics and photovoltaics.

Sustainability
Faculty across the college are engaged in some form of research involving sustainable practices, design or technologies. Research in this area includes water quality, wastewater treatment and watershed management.

Systems Integration
This area encompasses research in automation, robotics and systems and process control, and inspires keen interest in our students.

Water
Research in this area includes water quality, wastewater treatment and watershed management.

UNIVERSITY OF ARKANSAS

VIVAS LLC

When researchers collaborate, businesses and the public win. That's the case with Vivas LLC, a new company with licensed technology that can be used to train medical professionals and test medical devices.

Vivas was formed by two University of Arkansas engineering professors and a doctoral student in response to a lack of useful models of human blood vessels for their research.

The U of A researchers – Morten Jensen, associate professor of biomedical engineering; Jamie Hestekin, professor of chemical engineering; and Megan Laughlin, a doctoral student in biomedical engineering, partnered with Fort Smith-based Humimic Medical LLC for the project. Humimic produces medical gels that simulate human tissue, and the researchers were able to use the gels to make realistic models of human blood vessels.

"We use models of the human fluid flow system extensively in our cardiovascular biomechanics research laboratory," Jensen said. "This project was a natural bi-product of those efforts."

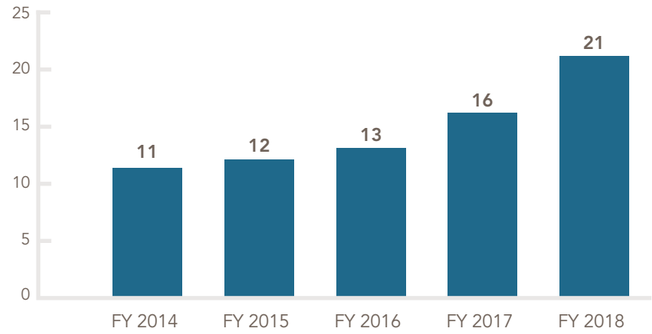
The end result is a product that lets researchers and medical professionals avoid many clinical training problems, including repeated needle sticks on patients.

College of Engineering Startup Companies

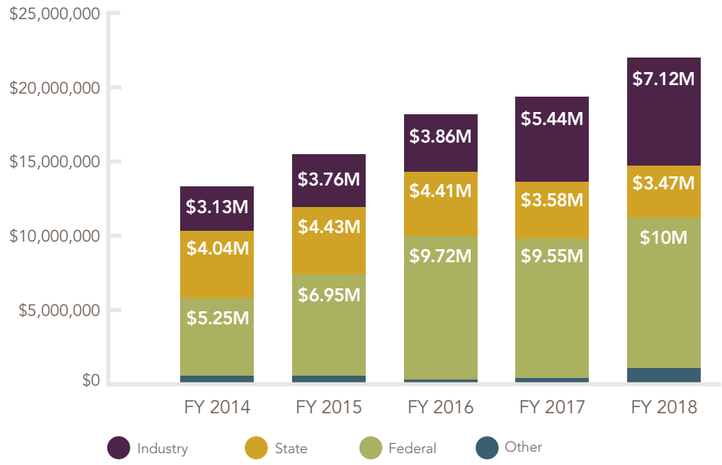
Since 1990, 26 companies have been created based on engineering research at the University of Arkansas.

1990	1
1999	1
2003	1
2004	1
2005	8
2007	2
2008	1
2009	4
2010	1
2011	1
2014	2
2016	1
2017	1
2018	1

Invention Disclosures

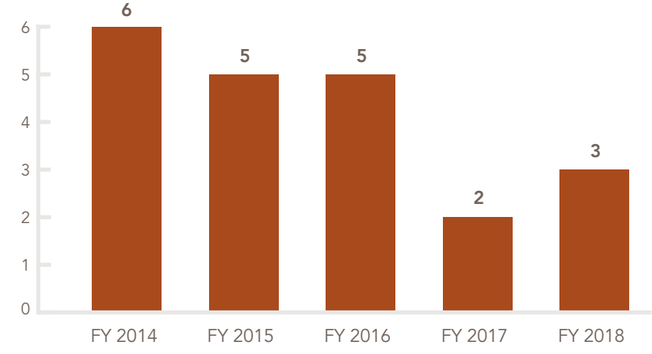


Research Expenditures by Source*



Source: ASEE Research Expenditures Report
Other Categories Include: Foreign Governments, Foundations, Other Non-Governments

Patents Awarded



Preparing for Tomorrow

We plan to encourage faculty development in entrepreneurship, by providing opportunities such as commercial concept testing, academics in residence positions in industry, economic development initiatives and community service.

CHARLES ZIMMERMAN, P.E.

B.S.C.E. 1985 | Global VE

Chair of the Engineering Dean's Advisory Council

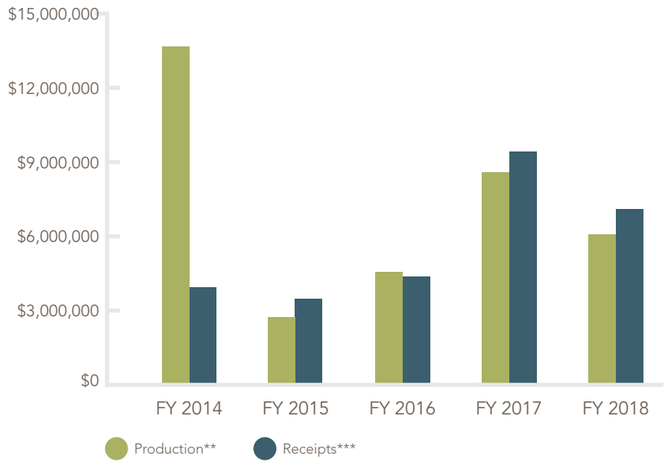
"These are exciting times at our University and at our beloved College of Engineering! Even with the strain that aggressive growth can place on a program, our students and faculty continue to excel. Undergraduate peer assessment ranks, peer assessment scores, graduate rankings and reputation scores are all at or near all-time bests, and these will only get better as last fall's new freshman average ACT scores were at an all-time high.

And as a first-generation college graduate myself, I am so proud of the fact that one in five students in our 2018 freshman class are first-generation students. Resources supporting these students, such as the new Student Success Center, Advance Arkansas scholarships and mentoring programs are more important than ever. These students are a critical part of our community and the future of our state.

And while we have always known the quality of our faculty is one of the best kept secrets in the nation, word is beginning to get out. A record NINE University of Arkansas faculty members received the National Science Foundation's most prestigious award in support of early-career research during the university's 2018 fiscal year. Seven of these (yes, seven) were from the College of Engineering! None of our SEC, or other typical peer institutions come close to this accomplishment and we even out-pace most of those traditional "big name" engineering programs.

While we all know our University and our College have always been great, many of the numbers and other public ratings are beginning to highlight that what we have always intuitively known is now becoming a well-documented and very public reality. It is truly exciting to see what our Dean, our faculty and staff, our alumni, and most importantly our students are accomplishing. This is a great time to be an Arkansas Engineer!"

Philanthropic Giving*

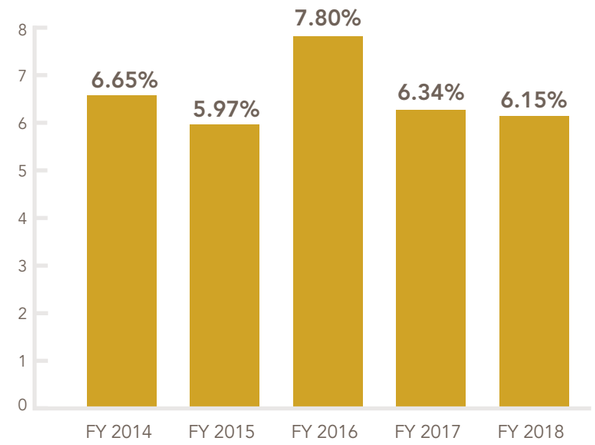


** For more information, see Gifts and Endowments chart on Appendix page 37*
*** Production: new gifts received or pledged during the fiscal year, including payments that will be received in future years*
**** Receipts: gifts received during the fiscal year, including payments on pledges from prior fiscal years*

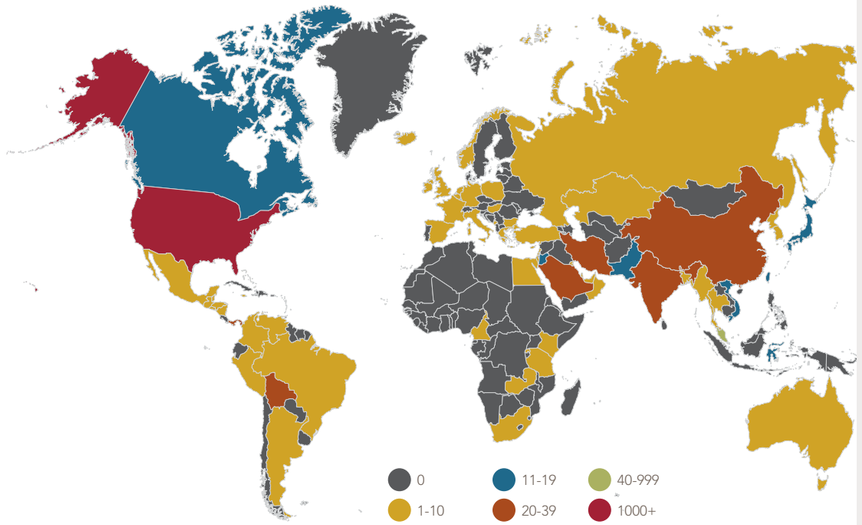
Endowed Faculty Positions

2014	2015	2016	2017	2018
33	33	34	35	35

Percentage of Alumni Who Give



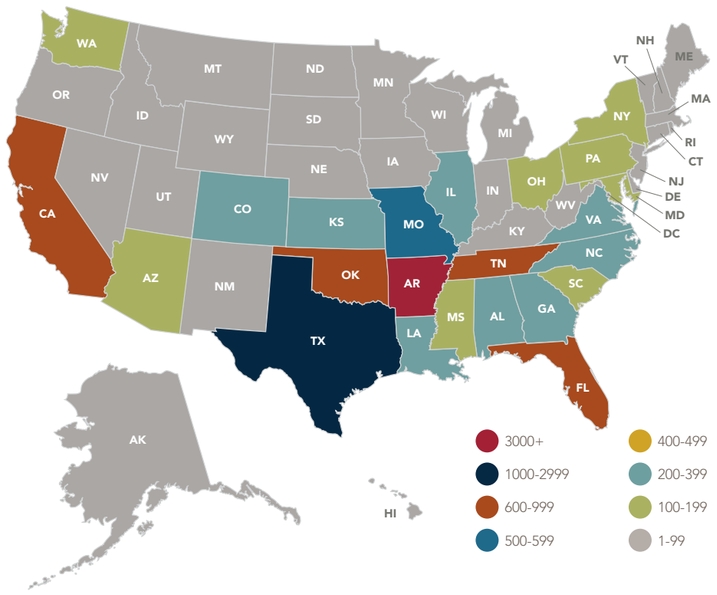
Alumni By Country



Endowed Scholarships and Fellowships

2016	2017	2018
133	139	146

Alumni by State



HALL OF FAME AWARDEES

Kevin W. Brown, BSCHE 1981

Kenneth William Keltner*, BSIE 1959

DISTINGUISHED ALUMNI

Robert W. Arvin, MSOM 2012

Gregory L. Baltz, BSAGE 1980

Roger Cordes, PhD, P.E., BSME 1991

Eugene C. Davis, BSCHE 1980

John Marshall, BSEE 1976

Jeremy Stobaugh, BSCSE 2000, MBA 2010

Rita Gail Willcoxon, BSIE 1982

Daniel H. Williams, P.E., BSCE 1981

EARLY CAREER AWARDEES

Eric A. DeCuir Jr., MS 2005, PhD 2008

Tyson Hall, BSCHE 2001, MBA 2002

Jessie Xu Jones, MSCE 2003

Jenni Kimpel, BSIE 2006

Drake McGruder, BSBE 2006, MSE 2012

Gregory Sisti, BSME 2004

Zhichun Xiao, MSCSE 2001, PhD 2005

**Posthumously*

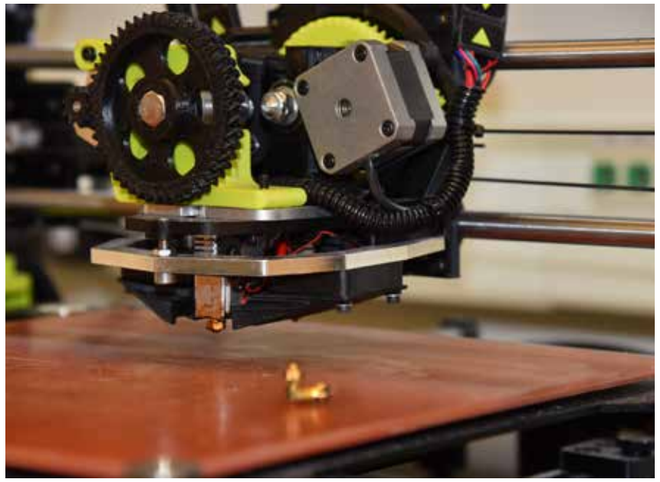
NCREPT Expansion

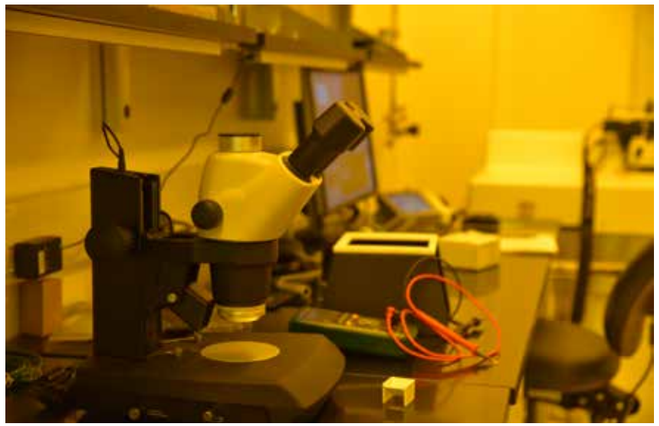
Leaders from the government, business and academic communities gathered to celebrate the expansion of one of the University of Arkansas' leading research centers, the National Center for Reliable Electric Power Transmission, also known as NCREPT.

The ceremony was the culmination of a $3 million, 5,000-square-foot investment to expand the research and industry partnership capabilities of the center, which is a collaboration between several universities and does work with more than 50 companies worldwide.

Speakers included Chancellor Joseph Steinmetz, Provost Jim Coleman, College of Engineering Dean John English, NCREPT Director Alan Mantooth, Meagan Frank from Senator John Boozman's office and Arkansas Senate Majority Leader Jim Hendren, who is a graduate of the U of A's electrical engineering program.

NCREPT's research is centered on designing, packaging and testing advanced power electronics, especially in relation to the power grid. It supports three other research centers in the Arkansas Research and Technology Park focused on the power grid, electric vehicle development and cyber defense systems.





Nanoscience Research

The build-out of the third floor of the Institute for Nanoscience and Engineering has provided researchers with expanded research space, allowing for the use of new equipment to study topics including nano-surface-engineering, nanomechanics and nano-tribology. Approximately 3,000 square feet of space opened in the spring of 2018. In the new space, researchers like Dr. Min Zou from the Department of Mechanical Engineering can conduct research and collaborate with industry partners using highly-specialized equipment.

Renovation Investment

2015	2016	2017	2018
$546,000	$229,500	$553,900	$120,850
$304,000	$430,500	$608,100	$5,554,300

Academic Research

Renovated Space

2015	2016	2017	2018
5,236 ft²	6,420 ft²	10,325 ft²	3,612 ft²
8,200 ft²	14,499 ft²	6,209 ft²	15,817 ft²

Academic Research

Total Space

2015	2016	2017	2018
77,416 ft²	84,229 ft²	84,229 ft²	84,229 ft²
92,272 ft²	102,067 ft²	102,067 ft²	109,812 ft²

Academic Research

Appendix

Revenues (excluding gifts)

	FY 2014		FY 2015		FY 2016		FY 2017		FY 2018	
State Appropriations & Tuition	$20,787,672	48.42%	$21,712,044	45.81%	$22,948,204	48.42%	$24,090,402	45.49%	$25,976,864	44.44%
Distance Learning Revenues, Ft. Smith, Service Centers, Conferences	$3,103,014	7.23%	$3,140,177	6.63%	$3,325,452	7.02%	$3,362,663	6.35%	$3,381,904	5.79%
Research Incentive Funds	$1,643,657	3.83%	$942,325	1.99%	$1,077,827	2.27%	$953,566	1.80%	$1,297,597	2.22%
Biological Engineering Teaching and Agricultural Experiment Station*	$1,787,000	4.16%	$1,851,719	3.91%	$1,893,397	4.00%	$1,898,336	3.58%	$1,974,884	3.38%
Sponsored Research (actual expenditures)**	$11,805,030	27.49%	$15,907,692	33.57%	$18,372,457	38.77%	$19,057,463	35.99%	$22,026,629	37.68%
Sponsored Activities and Scholarships (actual expenditures)	$1,518,160	3.54%	$1,537,123	3.24%	$1,658,126	3.50%	$900,368	1.70%	$1,002,185	1.71%
Student Equipment Fee Revenues (TELE-net)	$2,286,709	5.33%	$2,302,119	4.86%	$2,436,534	5.14%	$2,689,449	5.08%	$2,794,429	4.78%
Total	**$42,931,242**	**100%**	**$47,393,199**	**100%**	**$51,711,997**	**100%**	**$52,952,247**	**100%**	**$58,454,492**	**100%**

** Cooperative Extension Service not included*
*** As reported to ASEE and USNWR*

Expenditures (excluding gifts)

	FY 2014		FY 2015		FY 2016		FY 2017		FY 2018	
Salary and Benefits	$17,363,641	37.64%	$18,744,220	40.09%	$18,211,503	35.70%	$21,296,537	38.41%	$23,132,313	37.80%
Operating Expenditures	$2,615,636	5.67%	$1,301,172	2.78%	$1,149,449	2.25%	$922,571	1.66%	$980,572	1.60%
Dept Restricted Fees/Misc	$2,773,673	6.01%	$1,239,293	2.65%	$1,121,038	2.20%	$975,285	1.76%	$1,263,733	2.06%
Student Equipment Fees	$2,122,512	4.60%	$2,241,529	4.79%	$2,082,936	4.08%	$2,137,758	3.86%	$2,908,138	4.75%
Scholarships	$527,343	1.14%	$758,241	1.62%	$482,364	0.95%	$343,444	0.62%	$468,273	0.77%
Research*	$20,729,821	44.94%	$22,476,266	48.07%	$27,966,133	54.82%	$29,770,215	53.69%	$32,452,297	53.02%
Total Expenditures	**$46,132,626**	**100%**	**$46,760,721**	**100%**	**$51,013,423**	**100%**	**$55,445,810**	**100%**	**$61,205,326**	**100%**

**NSF expenditures report generated by Research Accounting*

Appendix

Gifts and Endowments*

Revenue	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018
Contributions - Expendable	$1,126,807	$871,121	$1,390,103	$1,310,687	$2,224,552
Contributions - Endowed & Restricted Gifts	$5,238,427	$3,620,544	$1,303,521	$948,276	$973,871
Investment Income:					
Expendable	$2,577,659	$2,617,325	$2,816,073	$2,969,366	$3,020,637
Endowed (reinvestment)	$0	$0	$0	$0	$0
Endowed Market Value Adjustment	$6,979,898	($298,852)	($4,280,657)	$6,814,020	$3,766,783
Net Transfers and Allocations	($1,224,342)	$0	$0	$0	$0
Total Revenue	**$14,698,449**	**$6,810,138**	**$1,229,040**	**$12,042,349**	**$9,985,843**
Expenditures	**FY 2014**	**FY 2015**	**FY 2016**	**FY 2017**	**FY 2018**
Scholarships and Student Support	$1,154,870	$836,285	$621,766	$621,152	$829,507
Other College Support	$2,272,358	$2,154,828	$2,002,086	$2,496,899	$2,435,864
Capital Outlays	$218,170	$72,484	$187	$7,231	$1,401
Development costs**	$347,631	$391,743	$131,177	$233,808	$176,264
Total Expenditures	**$3,993,029**	**$3,455,340**	**$2,755,216**	**$3,359,090**	**$3,443,036**
Revenues less Expenditures	**$10,705,420**	**$3,354,798**	**($1,526,176)**	**$8,683,259**	**$6,542,807**

** Planned and Charitable Remainder Trust Accounts are not reported.*
*** Development costs budgeted from U of A Foundation funds and includes administrative overhead charges to gift revenues.*

Gifts and Endowments Financial Position*

(Endowment Funds Held with the University of Arkansas Foundation, University of Arkansas and Agricultural Development Council)

	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018
Cash and Cash Equivalents - Expendable	$8,219,552	$11,335,354	$12,807,764	$14,109,710	$14,336,491
Pooled Investment Funds - Endowments	$55,042,921	$52,222,964	$52,164,081	$55,345,454	$59,765,483
Scholarship Endowments	$12,348,260	$14,376,759	$13,770,926	$14,516,478	$15,591,733
Fellowship Endowments	$3,785,316	$3,991,624	$4,292,359	$4,934,397	$5,729,113
Total Fund Balances	**$79,396,049**	**$81,926,701**	**$83,035,130**	**$88,906,039**	**$95,422,820**

** Planned/Charitable Remainder Trust Accounts are not reported. Biological Engineering accounts retroactively reported with Engineering*

Appendix

Distance Education

The Master of Science in Operations Management program was established in 1974 and since that time it has become the largest graduate degree program offered by the University. The purpose of the program is to create value through efficiency by applying the strategic, tactical and operational activities of operations management. The program offers classes at several graduate resident centers across the region. Students may complete all the requirements for the program at one of these centers, at the Fayetteville campus, or online.

Master of Science in Operations Management

Year	Number of Courses Offered	Student Credit Hours
2014	**29**	**8,994**
2015	**30**	**9,537**
2016	**31**	**9,243**
2017	**32**	**8,748**
2018	**33**	**8,230**

The Master of Science in Engineering program has been offering online degrees since 2009. It is a fully-accredited program taught by graduate faculty from the College of Engineering. This program is designed for students who want to further their education in a variety of engineering topics, and its graduates are well-prepared for a career in engineering and management of engineering systems, processes and organizations.

This program is consistently ranked in the top 30 for best online graduate engineering programs and best online graduate engineering programs for veterans by *U.S. News & World Report*.

Master of Science in Engineering

Year	Number of Courses Offered	Student Credit Hours
2014	**62**	**1,116**
2015	**65**	**1,182**
2016	**67**	**1,677**
2017	**76**	**1,527**
2018	**75**	**1,821**

Appendix

Faculty Elected as Fellows of Professional Societies

National Academy of Engineering
Mike Johnson | John White | Ajay Malshe

ASM International
Ashok Saxena
Ajay Malshe

ASHRAE
Darin Nutter

American Concrete Institute
Frances Griffith
Micah Hale

American Institute for Medical and Biological Engineering
Jin-Woo Kim
Yanbin Li
D. Keith Roper
Lalit Verma

American Society for Engineering Education
Norman Dennis
Kim Needy
John White

American Society for Engineering Management
Heather Nachtmann
Kim Needy
Ed Pohl

ASTM International
Ashok Saxena

American Society of Agricultural and Biological Engineers
Lalit Verma
Yanbin Li
Otto Loewer

American Institute of Chemical Engineers
Robert Babcock
Tom Spicer
Ranil Wickramasinghe

American Society of Civil Engineers
Norman Dennis
Findlay Edwards
Ernie Heymsfield
Mike Johnson
R. Panneer Selvam

American Society of Mechanical Engineers
Rick Couvillion
Ajay Malshe
Steve Tung
Min Zou

City and Guilds of London Institute (UK)
Simon Ang

Electrochemical Society
Simon Ang

Indian Society of Agricultural Engineers
Lalit Verma

Institute for Operations Research and Management Sciences
Greg Parnell
John White

Institute of Electrical and Electronic Engineers
Simon Ang
Samir El-Ghazaly
Alan Mantooth

Institution of Engineering and Technology (UK)
Simon Ang
Omar Manasreh

Institute of Industrial and Systems Engineers
Richard Cassady
John English
Heather Nachtmann
Kim Needy
Ed Pohl
Manuel Rossetti
John White

Institute of Physics
Ajay Malshe

International Academy of Agricultural and Biosystems Engineering
Lalit Verma

International Academy for Production Engineering
Ajay Malshe

Institute of Biological Engineering
Yanbin Li
Lalit Verma

International Congress on Fracture
Ashok Saxena

International Council on Systems Engineering
Greg Parnell

Lean Systems Society
Greg Parnell

Military Operations Research Society
Greg Parnell

National Academy of Construction
Mike Johnson

National Academy of Inventors
Hameed Naseem

Society of American Military Engineers
Mike Johnson

Society of Decision Professionals
Greg Parnell

Society of Reliability Engineers
Richard Cassady
Ed Pohl

Society of Tribologists and Lubrication Engineers
Min Zou

Appendix

College of Engineering Administrative Contacts

DEAN AND ASSOCIATE DEANS

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Engineering Dean's Advisory Council

Charles Zimmerman, *Council Chair*
President & Owner, Global VE

Troy Alley, Jr.
Executive Vice President
Con-Real, L.P.

Gregory Baltz, Sr.
Founder & President
Running Lake Farms

Bami Bastani
Senior Vice President
GLOBALFOUNDRIES

Sherman Black
CEO
Conservis

Kevin Brown
Executive Vice President,
Manufacturing & Refining (retired)
LyondellBasell Industries

G. Kent Burnett
Senior Vice President of IT &
e-commerce (retired)
Dillard's Department Stores, Inc.

Ansel Condray
Chairman & Production
Director (retired)
ExxonMobil International, Ltd.

Melinda Faubel
Director of External Affairs
AT&T Arkansas

Alan Fortenberry
CEO
Beaver Water District

Kendall Harris
Provost & Vice President of
Academic Affairs & Research
Texas Southern University

Bob Harrison
Vice President & Principal
ECCI

Grady Harvell
President & COO
W&W/AFCO Steel, Inc.

David Humphrey
Vice President, Investor Relations
ArcBest

James "Jon" Keel, Jr.
Founder & CEO
Improved Results

Jack King
President & CEO (retired)
Oglethorpe Power Corporation

Rodger Kline
COO (retired)
Acxiom Corporation

Vincent Lyons
General Manager, North Texas &
Eastern Region Engineering Operations
Raytheon

John Marshall
President
Coastal Partners, Inc.

Charles "Micky" Mayfield, Jr.
Sales Vice President (retired)
Nokia Siemens

Kent McAllister
President - Projects
Wood

James McClelland, Jr.
Chairman Emeritus
McClelland Consulting Engineers, Inc.

Pamela McGinnis
President of Global Marketing
Phillips 66

Marji McNeill
Vice President & Director,
Compliance & Ethics
Flint Hills Resources

Adam Monroe
President - Americas
Novozymes

Tom Pierson
Founder & CTO
TAS Energy, Inc.

Karl Schubert
President & Principal Consultant
TechNova Consulting, LLC

Patrick Schueck
President
Lexicon, Inc.

Stuart Scott
Executive Vice President & CIO
J. B. Hunt Transport, Inc.

Ami Spivey
Senior Vice President,
Next Generation Supply Chain (retired)
Walmart Stores, Inc.

W. Robert Storey
Principal
The MVR Company

Leon Topalian
Executive Vice President
Nucor Corporation

Chris Weiser
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J. V. Manufacturing, Incorporated

Bruce Westerman
Congressman

Daniel Williams
CEO & Chairman of the Board
Garver LLC

Lang Zimmerman
Vice President
Yelcot Communications


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ARKANSAS