COLLEGE OF ENGINEERING

2020 FACT BOOK

UNIVERSITY OF ARKANSAS

AS DEAN OF ENGINEERING since 2013, it has been my honor to present the Fact Book, which provides an update on our progress toward our strategic goals. Growing and diversifying our student and faculty populations, improving our research engine, engaging more effectively with our industry partners – we've seen incredible progress in all these areas over the last few years. That's why it's so bittersweet for me to move on to my new role as Vice Chancellor of Research and Innovation at the University of Arkansas. I'm looking forward to staying engaged with the excellent researchers in the College of Engineering, and I'm confident the College will continue to excel under the leadership of our new dean, Kim LaScola Needy. Dean Needy is an internationally-recognized scholar, a seasoned leader in higher education and a longtime member of the faculty in the Department of Industrial Engineering at the University of Arkansas. The future is bright and getting brighter for our College. Thank you for allowing me to serve as your dean, and stay in touch.

Warmly,

John English
Vice Chancellor for Research and Innovation
Irma F. and Raymond F. Giffels Endowed Chair in Engineering

Thank you to Vice Chancellor English for the kind introduction and for all the hard work over the past several years to position the College of Engineering for success. I'm thrilled to assume the leadership of the College of Engineering and serve at such an important time in our College's history. The fields of engineering and computer science are advancing rapidly, and we have a responsibility to ensure our students are prepared to succeed in today's environment. The pages ahead contain the stories of our students, staff and faculty, all of whom work diligently every day to advance our College, the University, the state of Arkansas, the nation and the world. We're in an excellent position as a College, and as Vice Chancellor English noted, the future is bright. I can't wait to work with you!

With enthusiasm,

Kim LaScola Needy

Kim LaScola Needy
Dean, College of Engineering

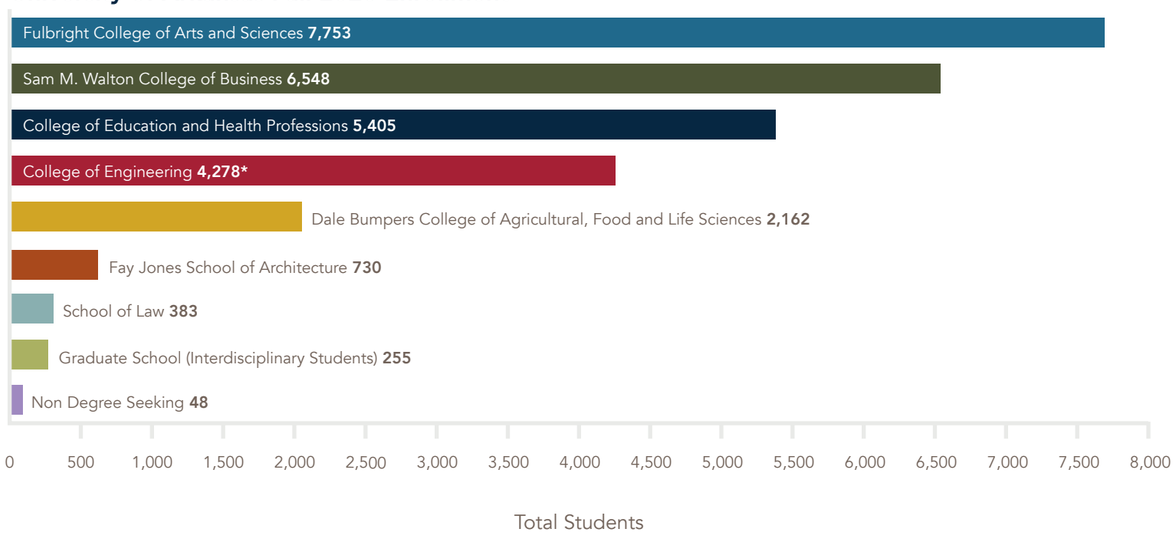
COLLEGE OF ENGINEERING
2020 FACT BOOK

Pictured on cover: Students wearing masks walk on campus near the Mechanical Engineering building in the fall of 2020. The impacts of the COVID-19 pandemic have been felt across campus, and students, staff and faculty have worked hard to implement safety measures that protect the community.

Above: Students in masks traverse campus during the summer of 2020.

University of Arkansas
Highlights

University of Arkansas Fall 2020 Enrollment

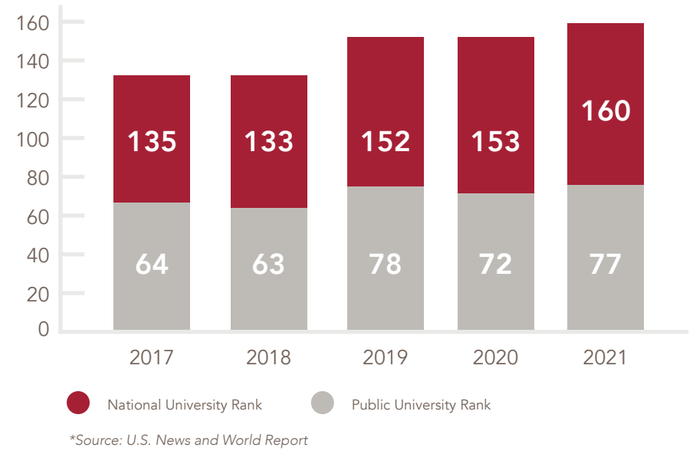


** Excludes interdisciplinary graduate students*

Fall 2020 Enrollment

22,825	4,354	383	27,562
Undergraduate	Graduate	Law	Total Enrollment

University of Arkansas Rankings*



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

College of Engineering
Highlights

3,206
Undergraduate Students*

1,079
Graduate Students**

4,285
College of Engineering Total Enrollment

315 Ph.D. students
currently enrolled

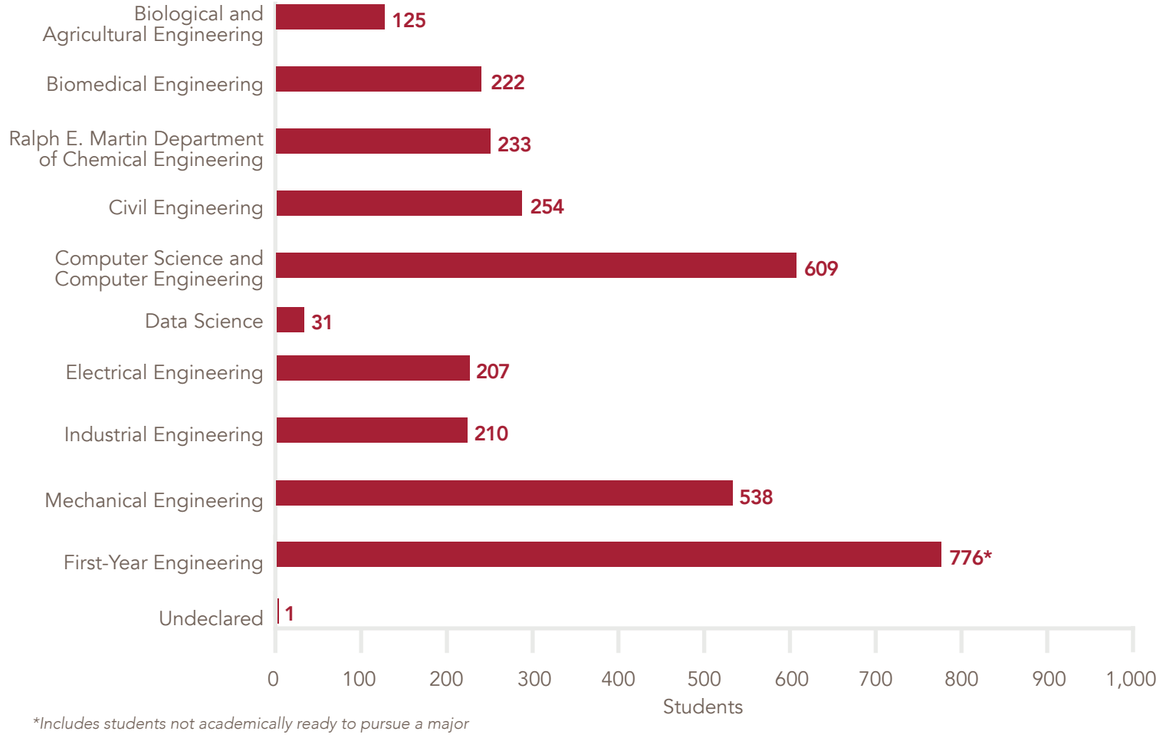
Our 2020 graduate enrollment is
27.7% female.

Underrepresented students — female, minority, and first-generation college students — make up
49% of the first-year class.

670 new first-year students

**Degree-seeking only*
***Includes engineering students enrolled in interdisciplinary programs and distance education*

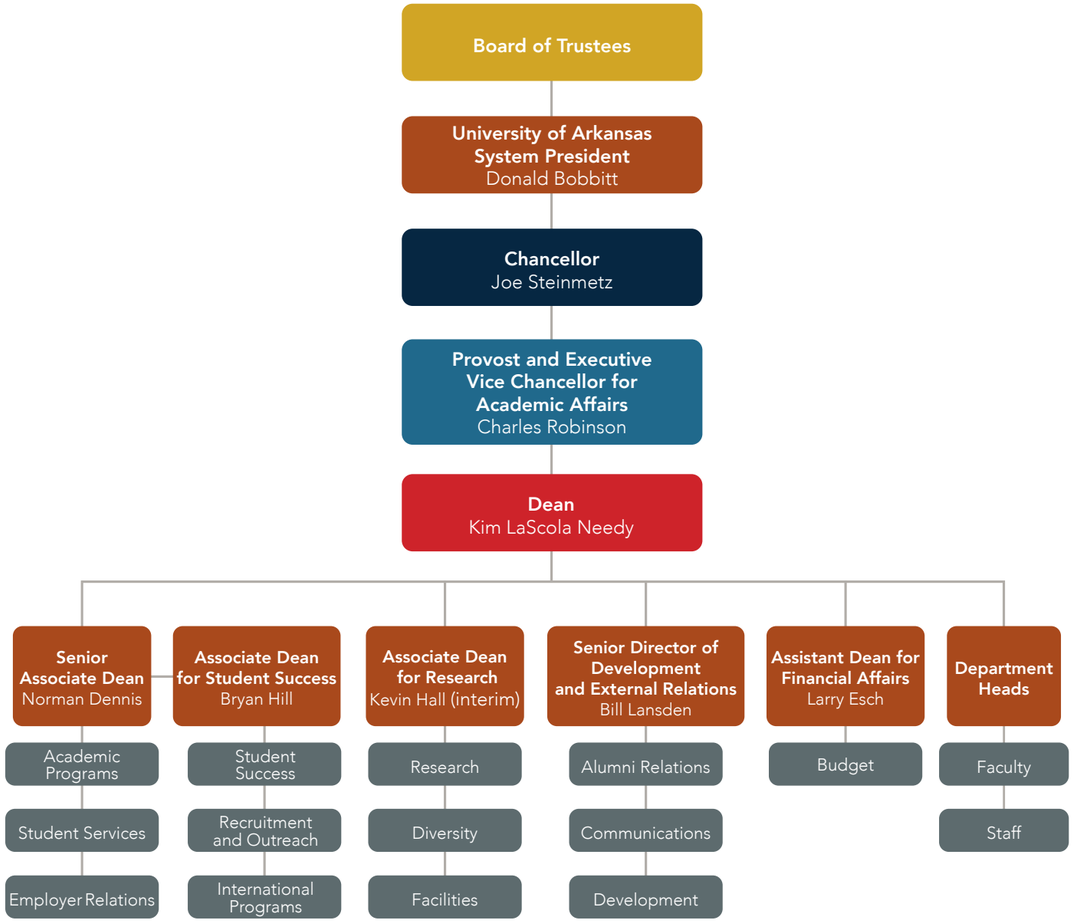
Fall 2020 Undergraduate Enrollment by Department



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

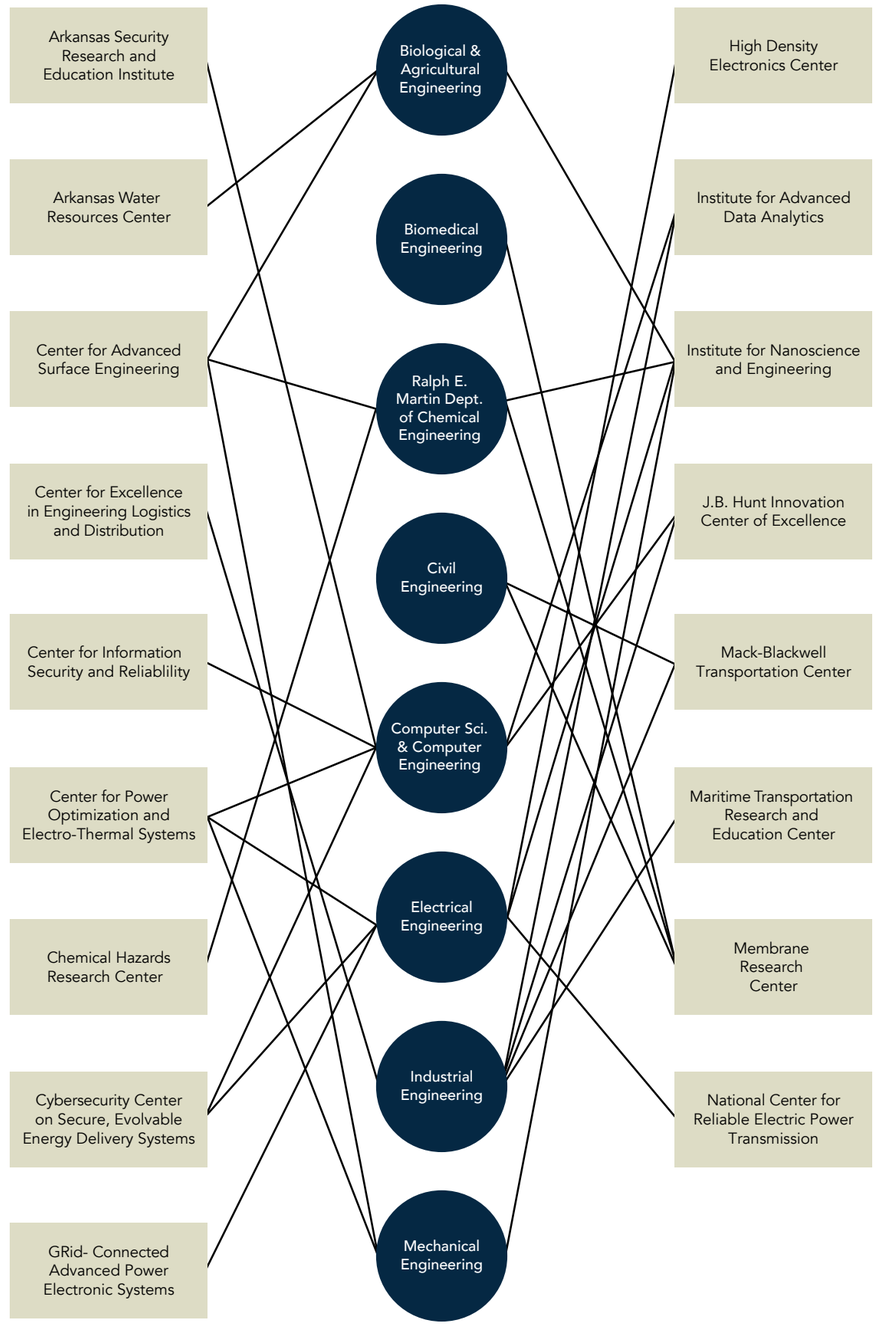
College of Engineering

Organization



College of Engineering

Departments and Centers



College of Engineering

Finances

Revenues (excluding gifts)

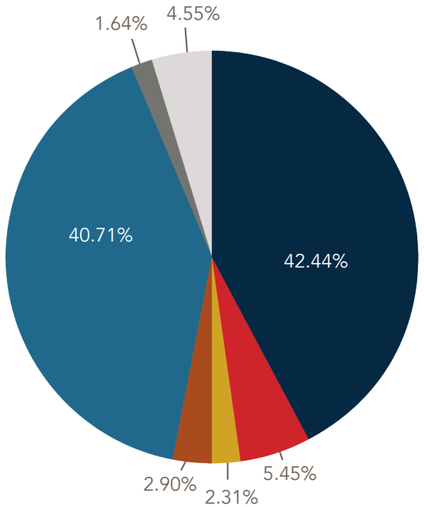
	2020
State Appropriations & Tuition	$28,339,317 42.44%
Distance Learning Revenues, Fort Smith, Service Centers, Conferences	$3,638,395 5.45%
Research Incentive Funds	$1,544,040 2.31%
Biological Engineering Teaching and Agricultural Experiment Station**	$1,937,982 2.90%
Sponsored Research (actual expenditures)*	$27,183,404 40.71%
Sponsored Activities and Scholarships (actual expenditures)	$1,095,756 1.64%
Student Equipment Fee Revenues (TELE-net)	$3,038,459 4.55%
Total	**$66,777,353**

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

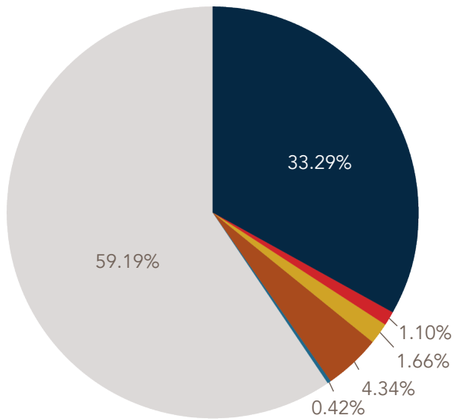
Expenditures (excluding gifts)

	2020
Salary and Benefits	$21,314,781 33.29%
Operating Expenditures	$705,760 1.10%
Dept. Restricted Fees/Misc.	$1,063,079 1.66%
Student Equipment Fees	$2,776,490 4.34%
Scholarships*	$266,215 0.42%
Research**	$37,894,740 59.19%
Total	**$64,021,065**

**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*

Ed Pohl, head of the Department of Industrial Engineering and Twenty-First Century Professor of Engineering, teaches a course on leadership in the fall of 2020. The classroom scene looked different because of COVID-19 with masks for both faculty and students, and a plexiglass barrier around the podium.

College of Engineering

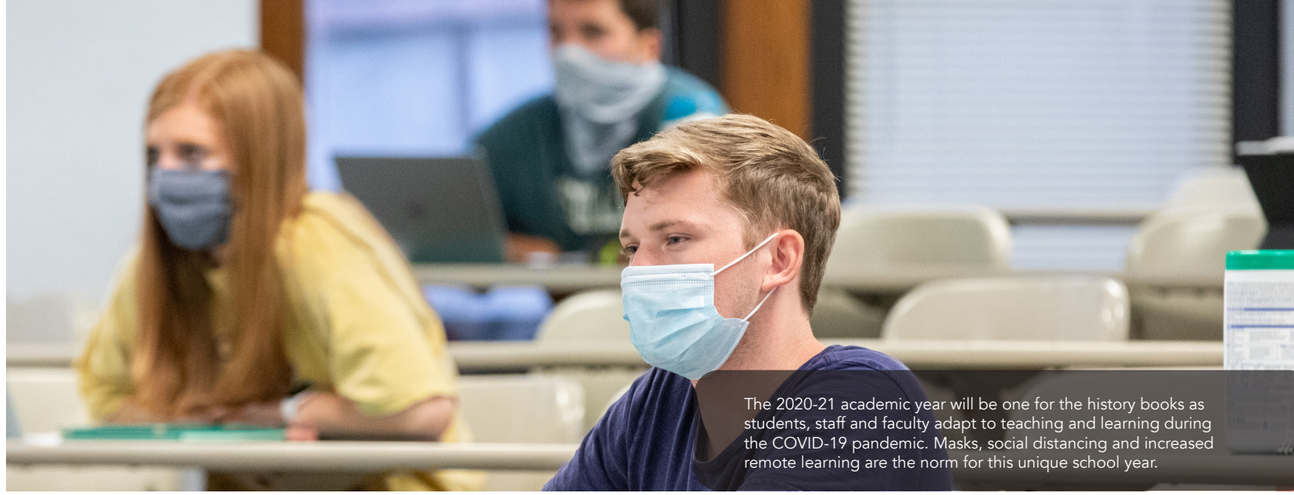
Strategic Plan

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



The 2020-21 academic year will be one for the history books as students, staff and faculty adapt to teaching and learning during the COVID-19 pandemic. Masks, social distancing and increased remote learning are the norm for this unique school year.

Balanced Growth Metrics

- 3,500 undergraduate students
- 1,000 master's students
- 350 doctoral students
- 135 tenured and tenure-track faculty members
- 65 teaching and research faculty members
- 0.9 staff to faculty ratio
- $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

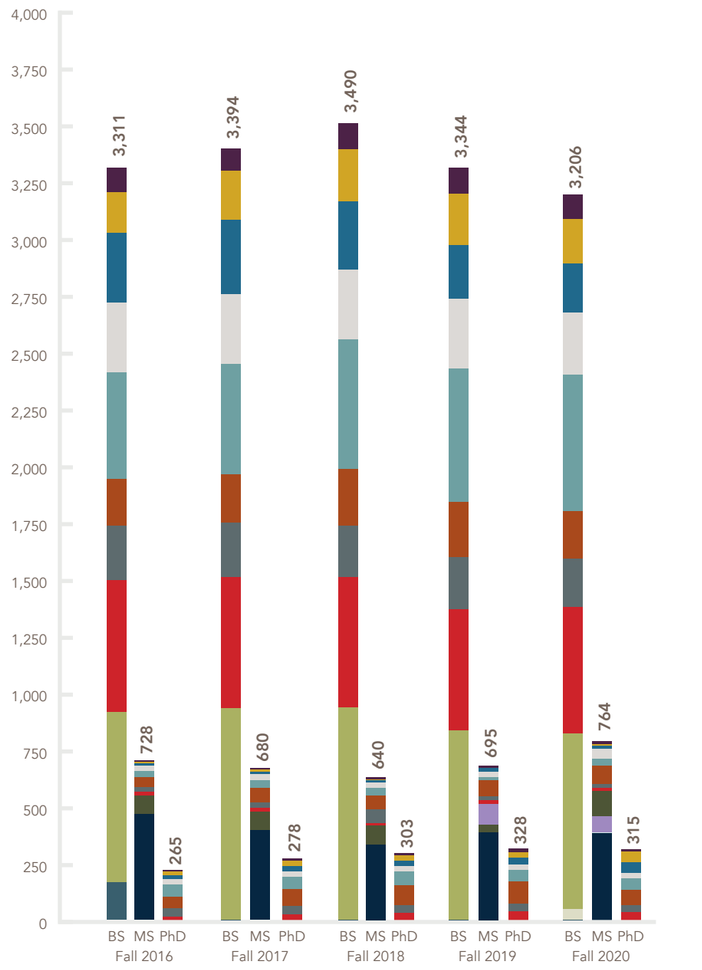
Balanced Growth

ELEANOR HENSON

B.S.B.E. 2020
College of Engineering
Outstanding Senior

"Due to the global pandemic, I have had the opportunity to reflect more on the magnitude of how my undergraduate experience shaped me before attending the College of Engineering commencement ceremony. Five months have passed since I attended my last (virtual) class from the University of Arkansas, and when I think about my time there one specific word comes to mind: community. The U of A was a large enough community to expose me to ideas and environments I had never experienced but also small enough to provide meaningful, life-time connections with professors, faculty, and my peers. I was able to conduct undergraduate research and work at the Arkansas Water Resources Center all four years, which prepared me to pursue a master's degree in environmental engineering at Colorado State University. Additionally, I was able to hold leadership positions across campus, specifically through the Volunteer Action Center and Razorback Food Recovery, which introduced me to some of my greatest passions outside of academia. There will never be enough 'thank yous' for the mentors and experiences that shaped me at the University of Arkansas."

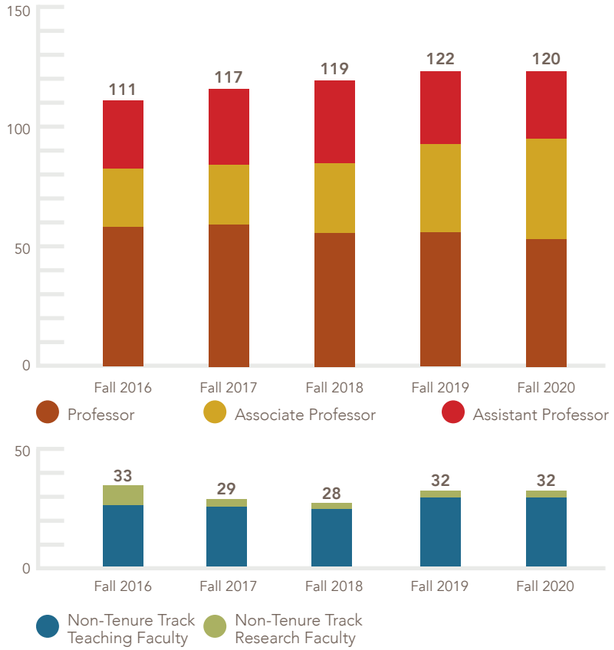
Enrollment by Department*



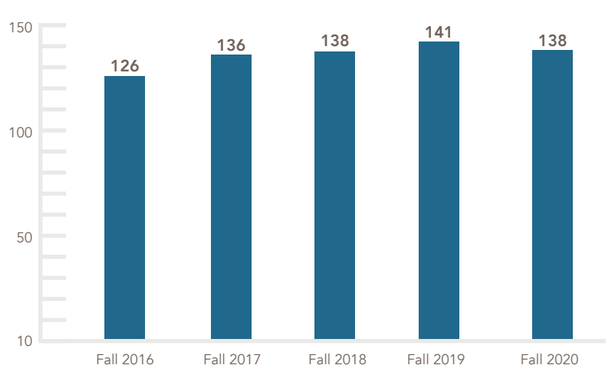
- Biological and Agricultural Engineering
- Biomedical Engineering
- Ralph E. Martin Department of Chemical Engineering
- Civil Engineering
- Computer Science and Computer Engineering
- Electrical Engineering
- Data Sciene
- Industrial Engineering
- Mechanical Engineering
- Engineering (online)
- Engineering Management (online)
- Operations Analytics
- Operations Management
- First-Year Engineering
- Undeclared

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

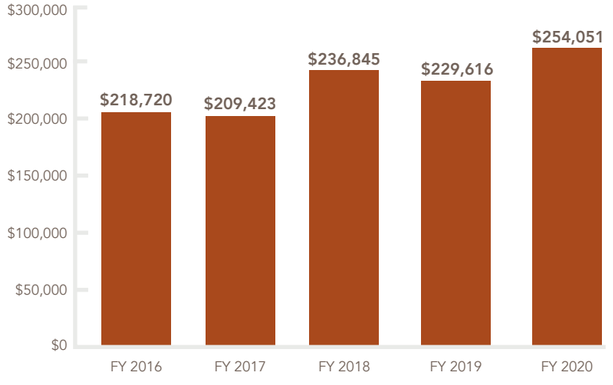
Faculty by Rank



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
teaching and research faculty members

0.9
staff to faculty ratio

$300,000
in research expenditures per faculty member

College of Engineering

Balanced Growth

NORMAN DENNIS

Senior Associate Dean, University Professor of Civil Engineering

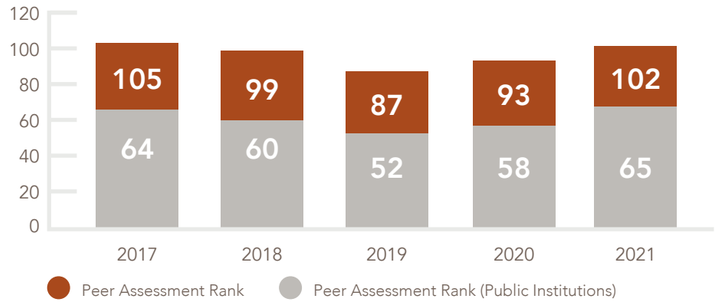
"The worlds of engineering and computer science are changing rapidly as technology advances. Today's students must be prepared to tackle challenges using a combination of technical expertise and critical thinking.

The College's curriculum focuses on providing students with both technical and interpersonal skills that will help them be successful after graduation. During the course of their studies, students pursue a rigorous curriculum in their chosen field, but also have the chance to work alongside their peers both within the College and across campus to develop experience as members of collaborative, cross-functional teams.

College of Engineering students also have a unique opportunity to engage with industry partners during their time on campus, providing valuable insight that helps them build connections and enhance their understanding of how classroom concepts are applied to real-world situations.

COVID-19 changed the delivery style of many of our courses and laboratory experiences, but it did not change the dedication of our faculty and staff to providing an excellent engineering education. College of Engineering faculty, staff and students worked hard to adapt to the realities of COVID-19, and the College remains committed to ensuring our students graduate equipped to succeed."

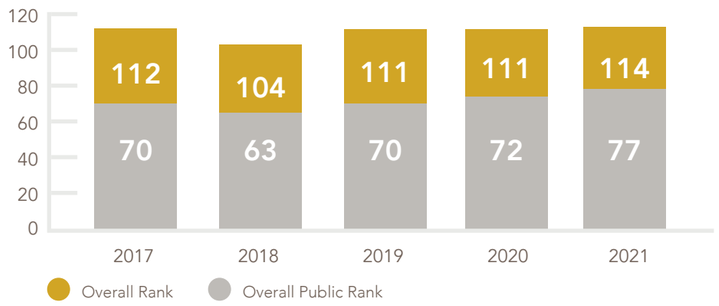
Undergraduate Ranking



Undergraduate Peer Assessment Score

2017	2018	2019	2020	2021
2.4	2.5	2.6	2.6	2.6

Graduate Ranking



Academic Reputation Score (out of 5.0)

2017	2018	2019	2020	2021
2.3	2.3	2.3	2.3	2.4

Non-academic Reputation Score (out of 5.0)

2017	2018	2019	2020	2021
2.7	2.8	2.7	2.8	2.8

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 2021 rankings are based on a two-year average of data from 2018 and 2019.

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.

JULIA LOSHELDER

Civil Engineering
Doctoral Candidate

Julia Loshelder was named a 2020 Department of Defense National Defense Science and Engineering Graduate Fellow and a 2020 National Science Foundation Graduate Research Program Fellow.

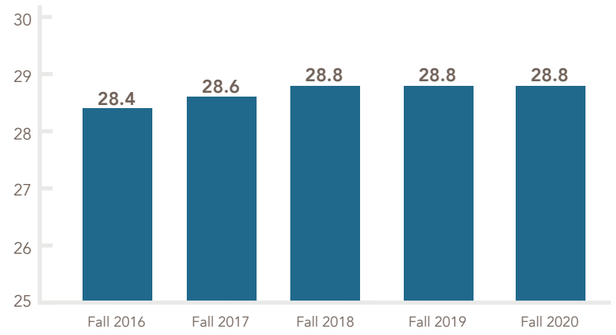
The Department of Defense awards the highly competitive scholarship to students planning to pursue a Ph.D. in areas of military importance. Both awards include three years full tuition and fees as well as funds for various academic expenditures.

Loshelder participated in several research projects both on and off campus. She conducted research with Richard Coffman, associate professor of civil engineering, in his soils laboratory, where her research focused on methods to determine the moisture content of soil through remote sensing, which was the basis of her honors thesis. That work was supported by funding from an Honors College Research Grant.

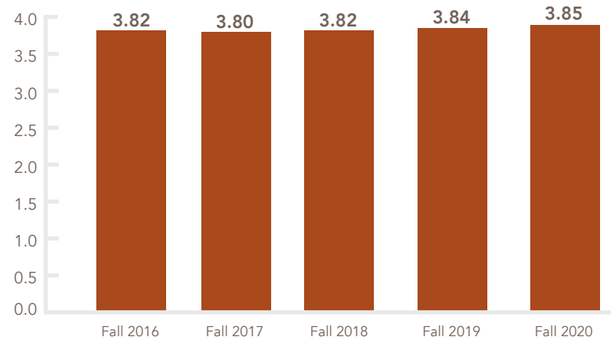
In the summer of 2019, Loshelder was chosen for a National Science Foundation Research Experience for Undergraduates at the University of California, Davis.

Loshelder interned with the Texas Department of Transportation during the summer of 2018. She first worked in the laboratory, conducting soil and asphalt testing, where she was introduced to the testing that she later used in her research on campus.

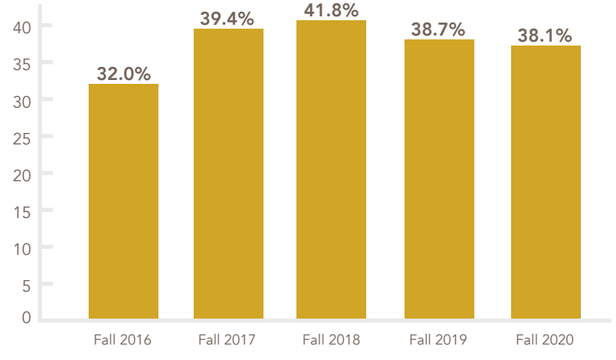
First-Year ACT Average



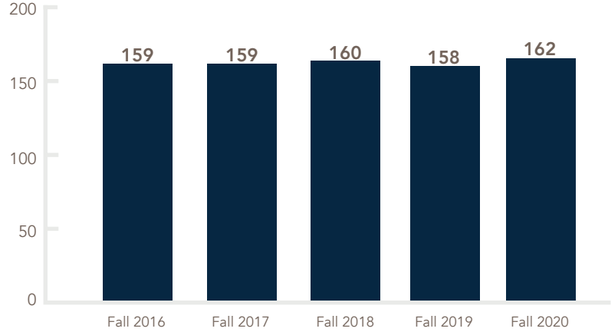
First-Year Average High School GPA



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 success of our students is at the core of the College of Engineering's mission. Our graduates must be prepared to enter a fast-moving work environment that requires both technical expertise and interpersonal skills like adaptability, collaboration and intercultural competence.

That reality has never been more clear than during the COVID-19 pandemic, when our students experienced a major shift in their educational and job-seeking experience. They handled the change with incredible resilience and are maximizing the opportunity to work in a largely remote setting – a skillset that is increasingly valuable in today's global economy.

We continue to focus on making the College of Engineering an attractive and welcoming environment for students from traditionally underrepresented backgrounds, and our faculty, staff and students are focused on learning best practices to foster diversity, equity and inclusion. There is always more to be done, and it remains a priority.

Our first-year class has the highest mean high-school GPA in the College's history, and the mean ACT score is tied with last year's record – a sign that the University of Arkansas remains the school of choice for high-achieving students from Arkansas and beyond.

The last year was filled with change, and our students, staff and faculty have come together to find solutions and provide an educational experience that will set the next generation on a path to success."

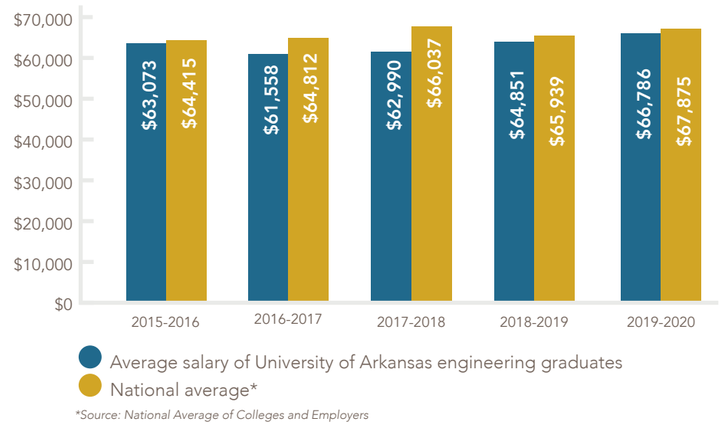
EMILY RODRIGUEZ

Industrial Engineering Student

"I am a student at the University of Arkansas thanks to the Engineering Career Awareness Program. ECAP has provided me with financial support, academic and professional guidance, and life-long friendships. My closest friends are ECAP students majoring in the same discipline I am. Assistant Dean Carter has been such a great mentor throughout my time here at the university and has provided me with amazing advice and moral support. ECAP has also allowed me to create friendships outside of the university. Throughout my past internships, I have met several ECAP alumni and the friendships that have developed from that 'ECAP experience' really connect us all.

I am majoring in Industrial Engineering and Minoring in Data Analytics. After graduation I will return as a full-time Data Science & Forensics Engineer for Lockheed Martin Aeronautics. I hope to one day give back to ECAP, because without this program, I would not be where I am today."

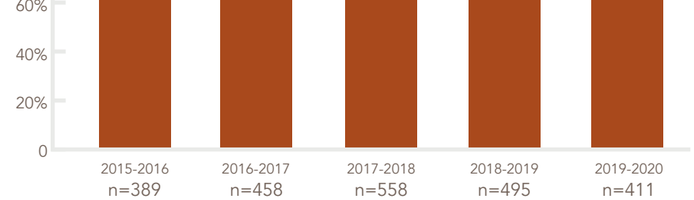
Engineering Graduate Average Starting Salaries



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 2020 Incoming Student Awards

1	36	156	28
Bodenhamer Fellows	Honors College Fellows	Chancellor Scholars	Merit Scholars

Number of Honors Graduates

2016	2017	2018	2019	2020
92	67	85	96	95

Recipients of Nationally Competitive Awards and Scholarships	2016	2017	2018	2019	2020
National Science Foundation Graduate Research Fellowship	2	2	3	1	6
NSF GRF Honorable Mention	1	3	4	1	3
Goldwater Scholarship	1	1	1	2	
Truman Scholarship	1			1	
Udall Honorable Mention			1	1	
Critical Language Scholarship			1	1	
Fulbright English Teaching Assistantship			1		2
Benjamin A. Gilman Scholarship				2	5
Japan Exchange and Teaching (JET) Program				1	1
Total	5	6	11	10	17

JAIRA PORTER

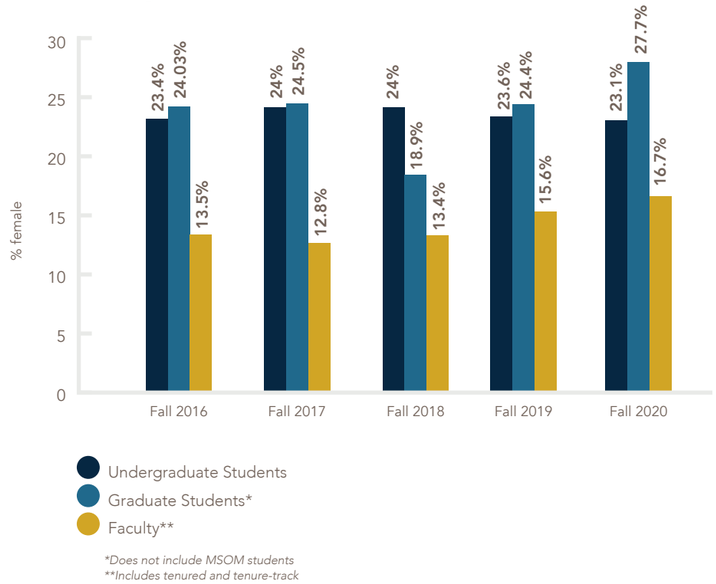
Industrial Engineering Student

"Entering college, I knew I wanted to succeed. Yet, I wasn't sure if I had all the resources to succeed. ECAP has provided me a foundation and many of the resources I need to be successful. Starting out, I was linked with like-minded students, building academic relationships that led to true friendships.

As I began my second year of ECAP, I had the opportunity to be a summer mentor, extending what was extended to me to new incoming first-year students. This was a great experience for me. I learned a lot of lessons on leadership and met a lot of smart incoming students. I've really valued ECAP's financial and academic support, the help with internships, and just having someone to talk to during a rough semester.

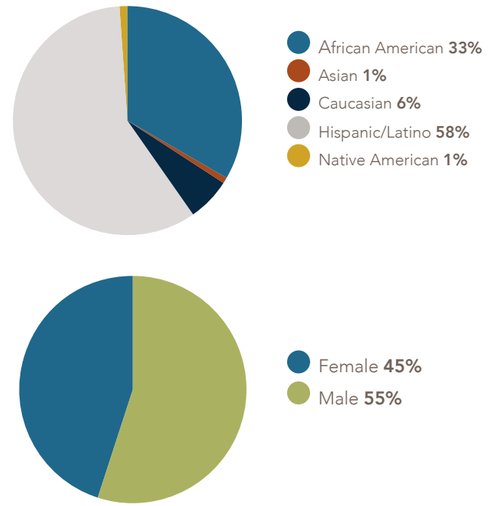
My hopes for a future career in industrial engineering are to share my skills and what I have learned from the University of Arkansas. ECAP has equipped me to share my thoughts, my personality and my voice by allowing me to experience opportunities I would not otherwise have been exposed to."

Gender Diversity

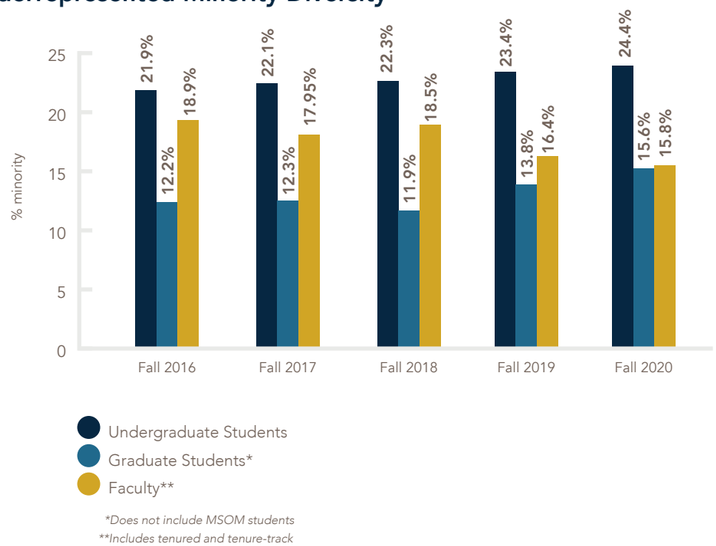


*Does not include MSOM students
**Includes tenured and tenure-track

Engineering Career Awareness Program Student Demographics



Underrepresented Minority Diversity



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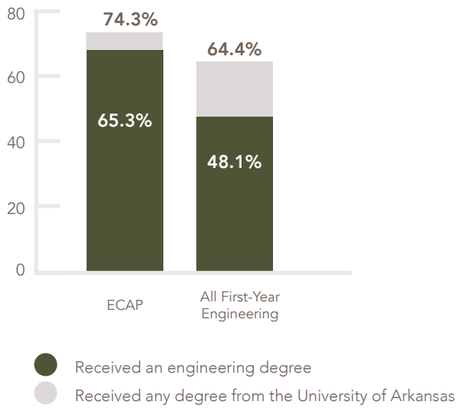
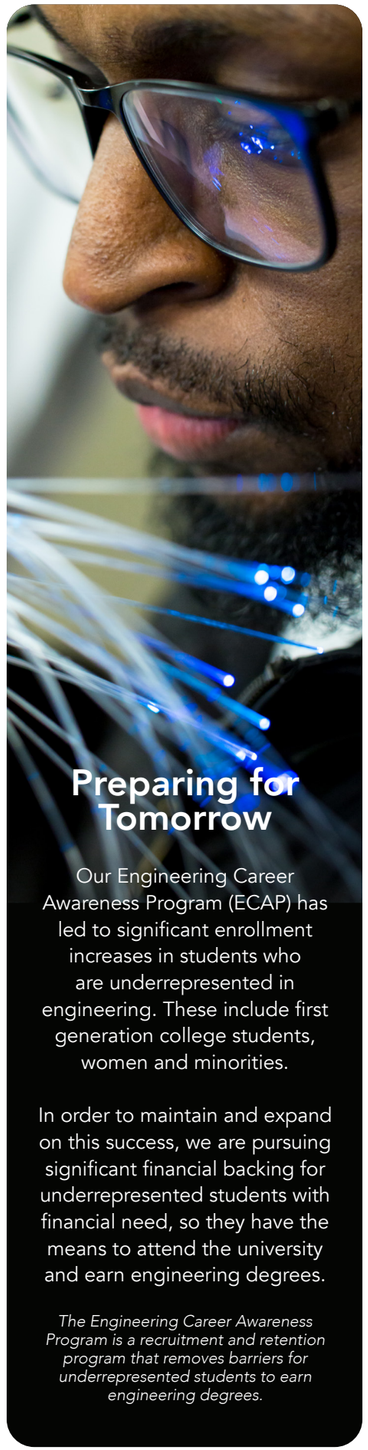
Six-Year Graduation Rates for 2007-2014 Cohorts





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.

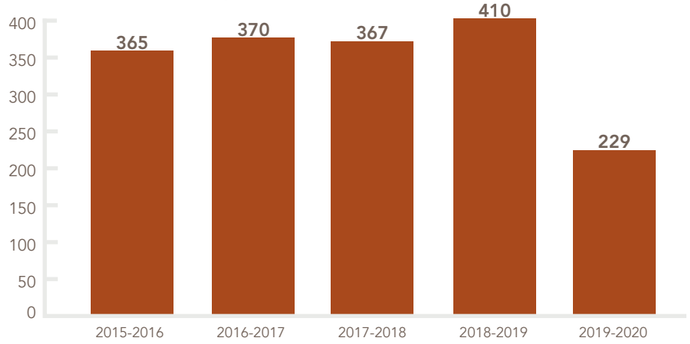
BREANNA KILGORE

First-Year Engineer of the Year

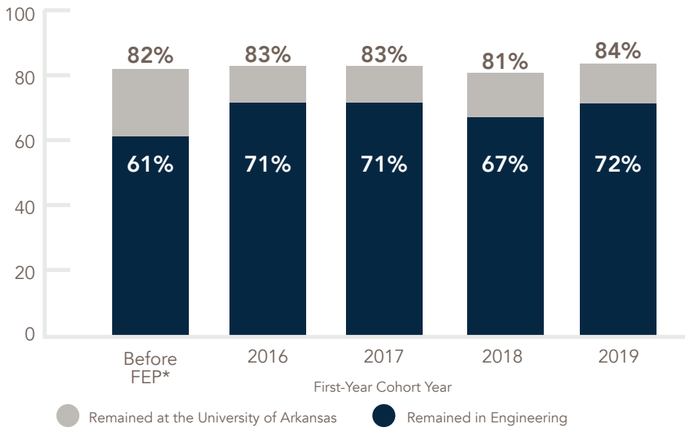
"I was drawn to the university because of its welcoming staff and the help available. I became interested in the STEM fields after completing multiple science courses in high school. Engineering at the University of Arkansas has revealed many opportunities in the engineering and technology field. I've joined multiple clubs and organizations to enhance my leadership and technical skills, and to further prepare me for the future. I'm majoring in biomedical engineering and I hope to use my degree to help design and innovate new, affordable medical devices to help people all over the world. Engineering here at the university has helped me explore this interest in globalization and plan for my future career in healthcare. I'm excited to go into the world and make it a better place using everything I've experienced and learned here at the University of Arkansas."

Experiential Learning

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

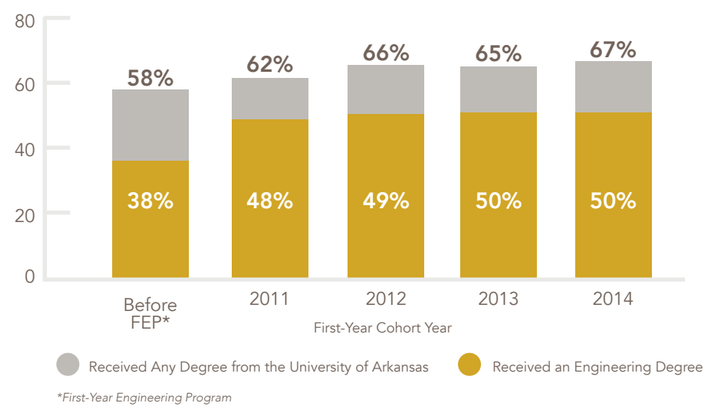


First-Year Retention Rate



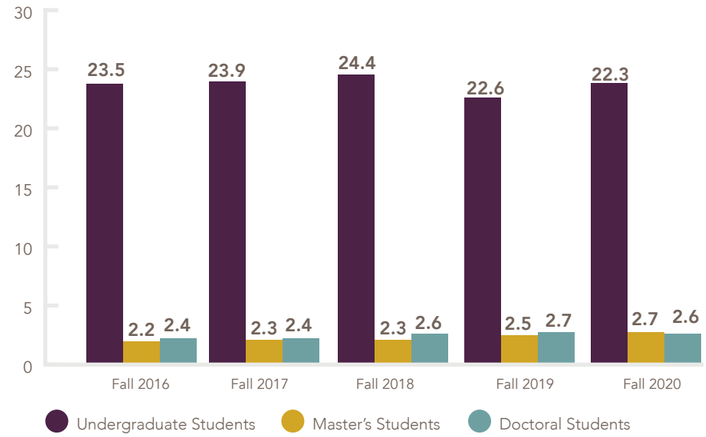
*First-Year Engineering Program

Six-Year Graduation Rate

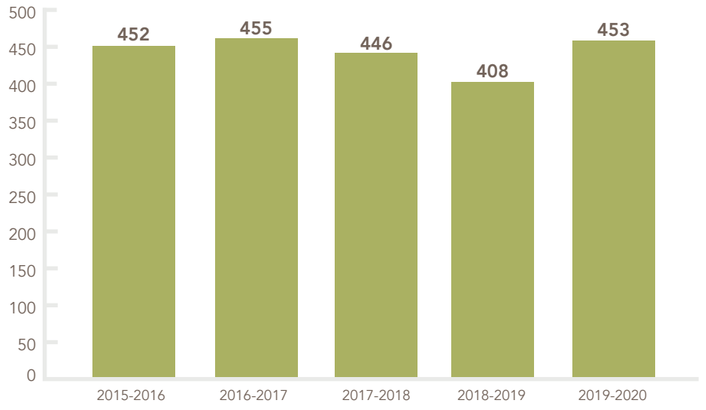


*First-Year Engineering Program

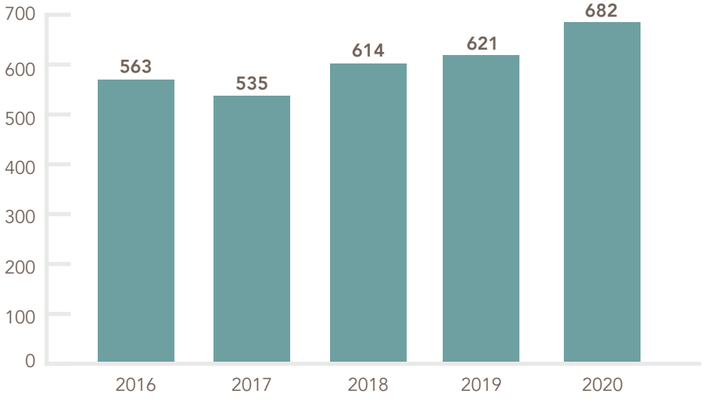
Student-Faculty Ratios



Student Semester Credit Hours per Faculty Full Time Equivalence



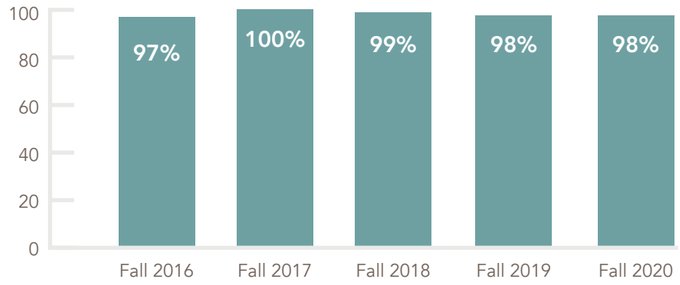
Bachelor's Degrees Awarded



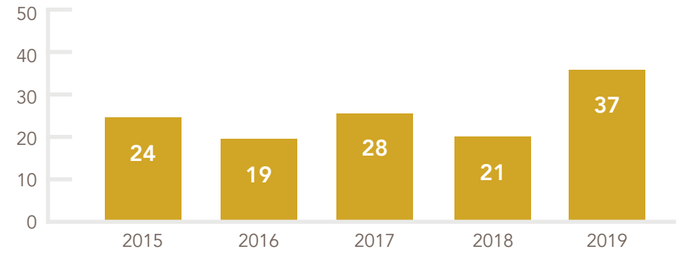
SHANNON SERVOSS
Associate Professor of Chemical Engineering, Co-Director of Undergraduate Research for the Office of Research and Innovation
Dean's Award for Excellence for Outstanding Public Service

Shannon Servoss has consistently placed a high value on the service component of the faculty mission, and has made contributions to the university, region, and her profession that have made deep and lasting differences in peoples' lives. The establishment of science clubs in local elementary schools exemplifies Servoss's approach to public service. She noticed that after-school activities related to science were non-existent at Butterfield Trail Elementary and quickly acted by founding a club in January 2016. Servoss has also been active in the American Institute of Chemical Engineers, chairing the Women in Chemical Engineering group.

Faculty Retention

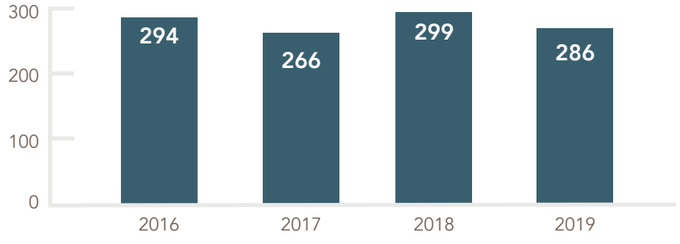


National Faculty Awards Received

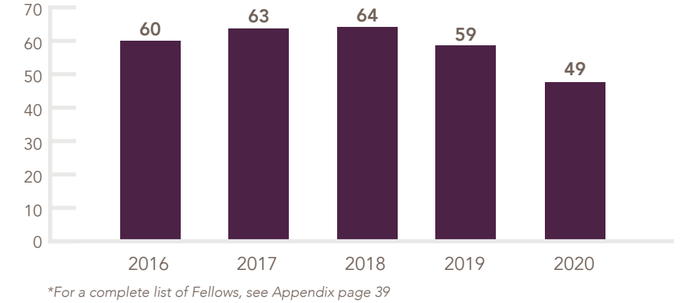


Professional Service Leadership

(number of external leadership positions held by faculty)



Society Fellows*

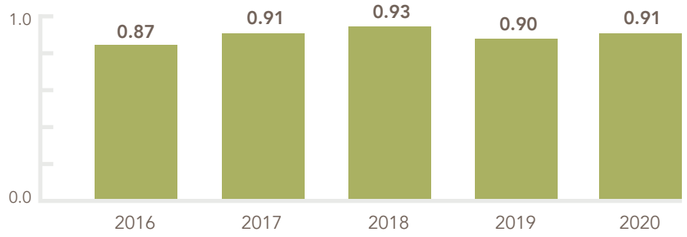


For a complete list of Fellows, see Appendix page 39

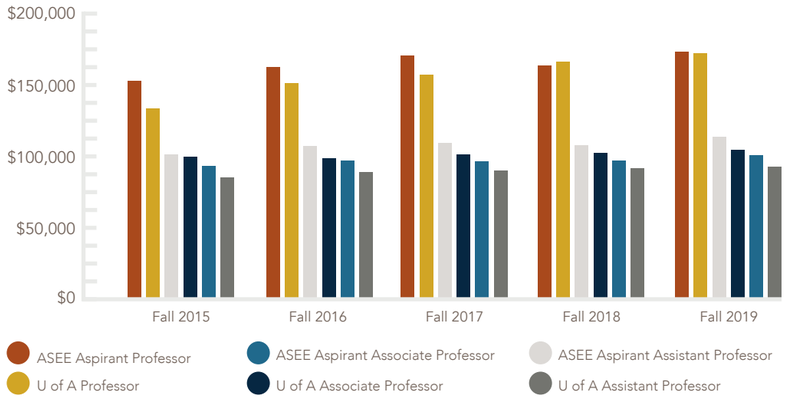
Membership in the National Academy of Engineering

2016	2017	2018	2019	2020
2 members	2 members	3 members	2 members	1 members

Staff-Faculty Ratio



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



*ASEE salary survey data for fall 2019 is not available until January.
Instructor salaries are not benchmarked in the ASEE salary survey.*

NSF CAREER Award Winners Since 2013

KELLY SULLIVAN
Associate Professor of Industrial Engineering
Dean's Award for Excellence for Rising Teaching

Kelly Sullivan effectively and innovatively delivers a variety of industrial engineering courses, is a leader in the development and implementation of the Industrial Engineering Honors Research Experience, and is an outstanding mentor of graduate and undergraduate students. From the time he was an undergraduate in the department, Sullivan has consistently demonstrated an appreciation of academic rigor and compassion for others. He has high expectations of his students, but he has high expectations of himself for doing what he needs to do to help the students meet those expectations.

KEVIN HALL
Interim Associate Dean for Research
Imhoff Award for Teaching

Kevin Hall was recognized for his excellence in the classroom, including having taught a required civil engineering undergraduate course 17 times since 2017, with an average evaluation score that was the highest in the department. He also earned outstanding reviews for his work on "Engineering Antiquity," a course taught through the Honors College in spring 2019. That success is a testament to his ability to engage a diverse group of non-STEM students in engineering material.

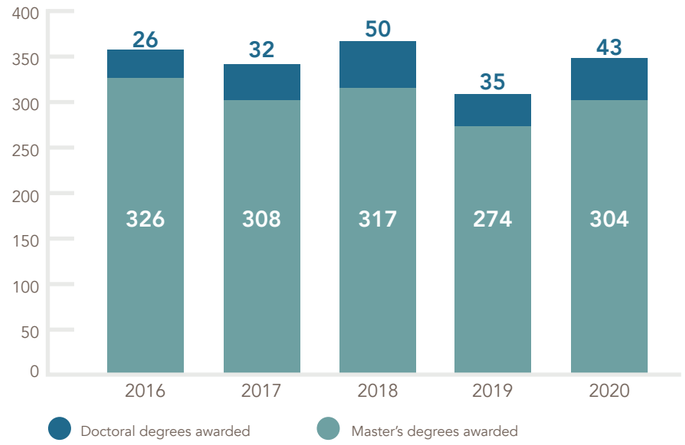
KEVIN HALL
Interim Associate Dean for Research

"It is often said that 'success breeds success.' As shown in the accompanying charts, this certainly held true in Fiscal Year 2020, which was another record-setting year for research in the College of Engineering in the areas of proposals, research awards, total expenditures, and invention disclosures.

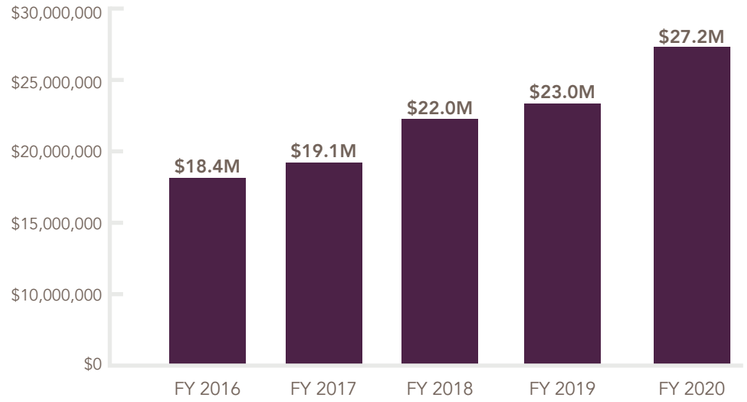
These accomplishments are truly a testament to the resilience of our research faculty and staff, who pushed through laboratory and personnel restrictions brought on by the COVID-19 pandemic. Many of our researchers also leapt into action to help fight the pandemic in Arkansas and around the world. In Civil Engineering, Associate Professor Wen Zhang developed a way to track the virus' spread through wastewater. In Biomedical Engineering, Associate Professor Morten Jensen developed an aerosol box to help protect healthcare workers as they cared for patients. In the Ralph E. Martin Department of Chemical Engineering, Professor Jamie Hestekin developed a spray that can be applied to high-touch surfaces like doorknobs to fight viruses and limit transmission of COVID-19.

While the numbers and metrics are of vital importance to our research enterprise, I am honored and humbled to be part of the College of Engineering research team which – in the words of our profession's Canon of Ethics – "...hold(s) paramount the safety, health, and welfare of the public...". The work of the faculty and staff to both keep each other safe and to pursue new discoveries which elevate the living conditions of people around the world is truly inspiring."

Advanced Degrees Awarded

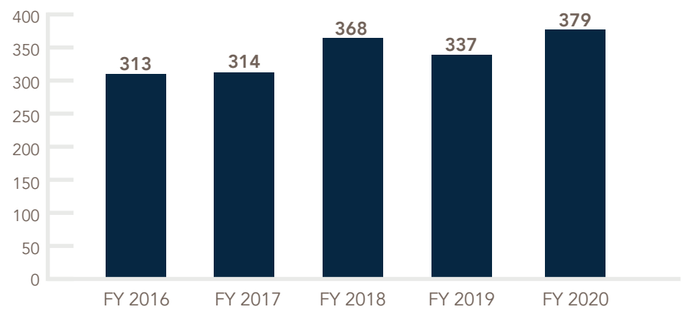


Total Research Expenditures*

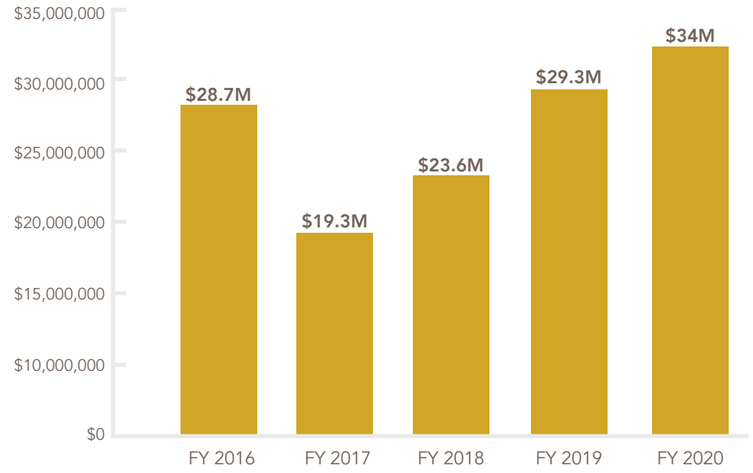


*As reported to ASEE/USNWR

Research Proposals Submitted



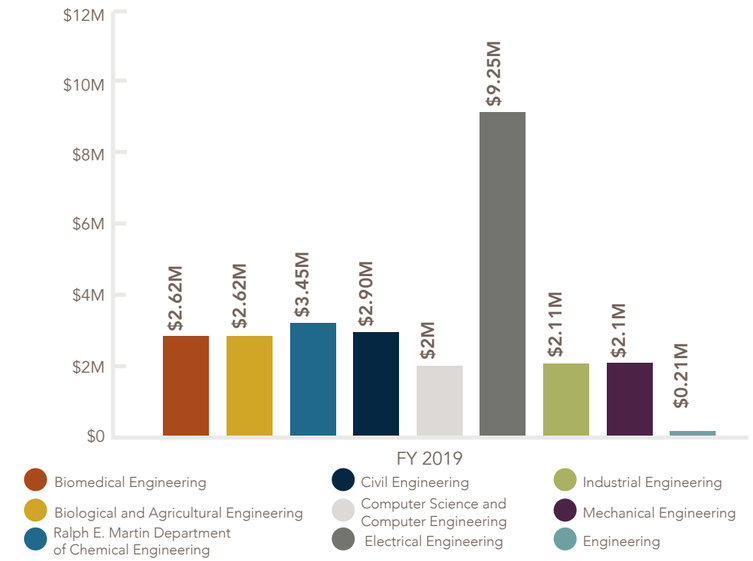
Research Grants Awarded



Peer-Reviewed Publications

2015	2016	2017	2018	2019
402	455	515	525	488

Research Expenditures by Department



YUE ZHAO
Assistant Professor of Electrical Engineering
Rising Star Faculty Research Award

During the last three years, Yue Zhao has built a large graduate program populated by one post-doctoral fellow, 10 doctoral students and two master's students. Working with those students, Zhao has published 11 journals and 22 international-conference papers since 2017. Zhao has also been successful in attracting external funding. His most visible research awards include the prestigious NSF CAREER award received in spring 2018, and a Department of Energy-funded a $3.4 million research award related to solar inverters, on which he is the principal investigator.

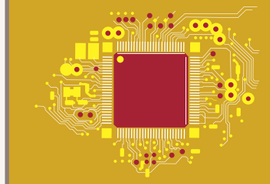
BENJAMIN RUNKLE
Professor of Biological and Agricultural Engineering Engineering
Collaborative Faculty Research Award

Since 2017, Benjamin Runkle's publication record includes 13 peer-reviewed journal articles, three other papers, two datasets and a book chapter – all of which were conducted collaboratively with at least one non-University of Arkansas co-author. His collaborators have included government researchers, faculty from other American universities and researchers from international institutions around the globe. Runkle's research grants have often been collaborative, including with U of A faculty.

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 20 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

Data Science

Our data science researchers are exploring real-time data collection and assessment, parallel data processing, machine learning, intelligent search, sensor network architecture and design flow, electronics packaging, and information transmission and processing.

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

Our innovation into modern manufacturing involves technology-driven manufacturing processes, assembly and control technologies, new automation, techniques, design and modeling of systems, process planning.

Membranes & Separations

Our researchers are exploring membrane materials, characterization, formation, and performance to improve energy production, water treatment, pharmaceutical purification, and chemical processing.

Water

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

UNIVERSITY OF ARKANSAS

NANOCELLULATIONS

Researchers at the University of Arkansas and the University of Arkansas for Medical Sciences have developed a long-lasting spray that disinfects surfaces for extended periods, even in heavy use, making them less likely to transmit infectious diseases.

The spray has been shown to be an effective antibacterial agent and is being explored for antiviral properties. The spray also lasts longer than standard cleaning solutions — researchers have demonstrated it can withstand up to 50 touches on a metal surface before it needs to be reapplied.

The spray was developed by a team that includes professor Jamie Hestekin and doctoral student John Moore, both in chemical engineering at the U of A, as well as professor Peter Crooks and postdoctoral fellow Soma Shekar Dachavaram, both from UAMS.

Researchers have started a business called Nanocellutions, where Moore is the CEO. The spray can be produced as a liquid, which can be aerosolized by the client, or it can come prepacked as an aerosol can.

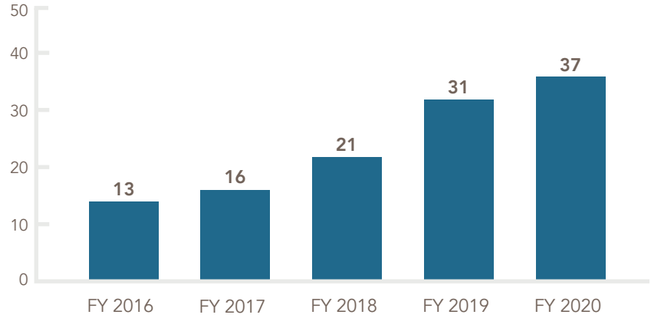
"The goal is to provide a quick-drying surface coating material that can be easily handled and applied by both large companies and consumers," Moore said.

College of Engineering Startup Companies

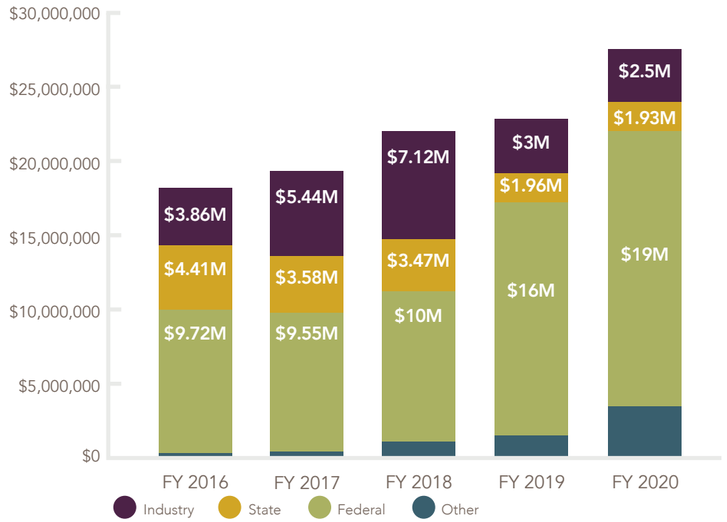
Since 1990, 30 companies have been created based on engineering research at the University of Arkansas.

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
2019	2
2020	2

Invention Disclosures

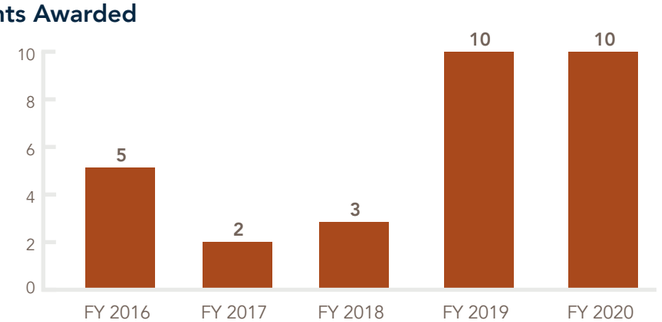


Research Expenditures by Source*



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

Patents Awarded



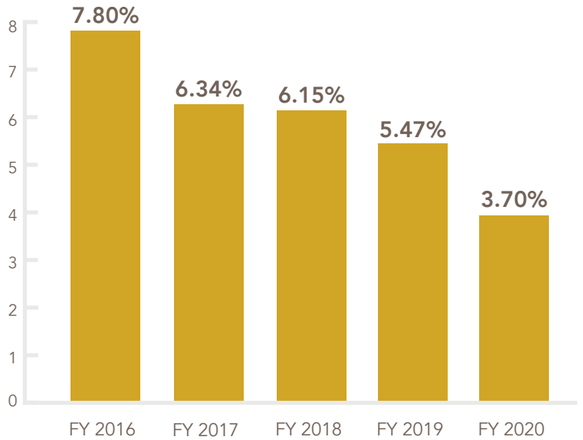
Preparing for Tomorrow

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.

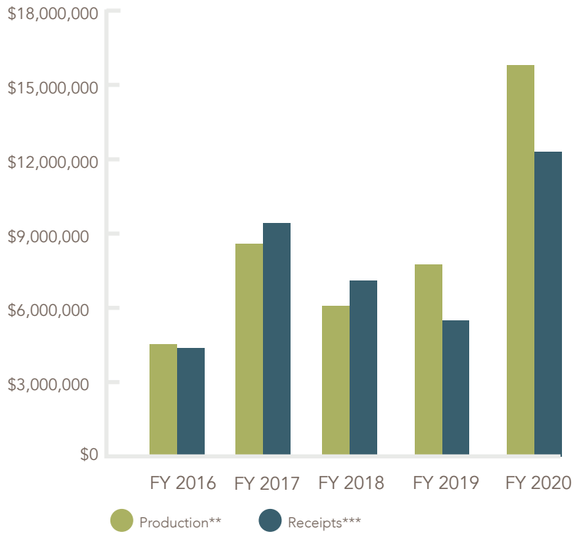
Endowed Faculty Positions

2016	2017	2018	2019	2020
34	35	35	36	36

Percentage of Alumni Who Give

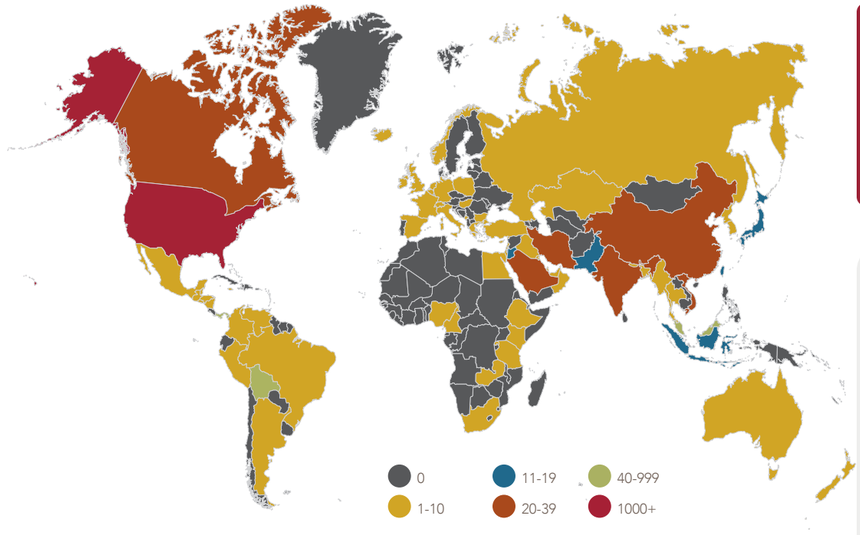


Philanthropic Giving*



** 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*

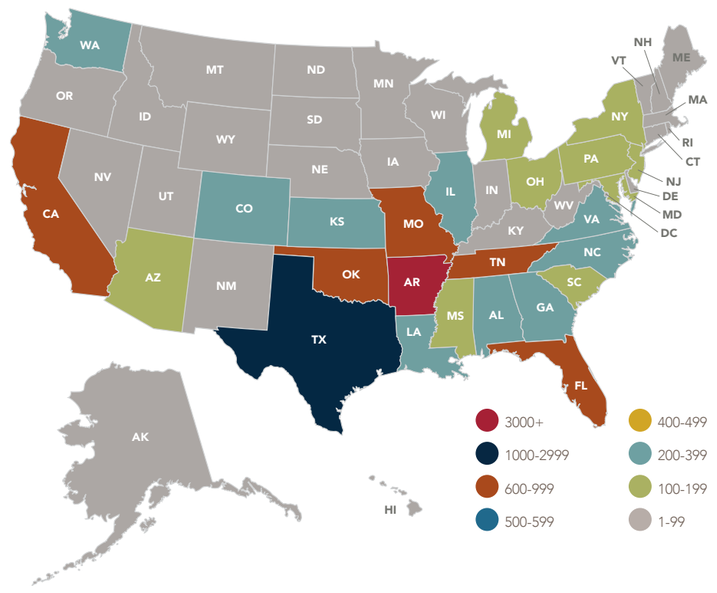
Alumni By Country



Endowed Scholarships and Fellowships

2017	2018	2019	2020
139	146	152	157

Alumni by State



Total Number of Alumni

2020
20,372

2020 Alumni Award Winners

HALL OF FAME AWARDEE

Grady E. Harvell, P.E., BSCE '72
John A. White, Jr., BSIE '62

DISTINGUISHED ALUMNI

Gregory Blair, BSCmpE '01
Keith Bradshaw, BSME '87
Jerrel M. Fielder, BSCSE '88
Dan R. Goodrich, Brig Gen (ret) USAF, MS '83
Brock Hoskins, BSCE '89
W. Kent McAllister, BSChE '87
Richard T. Penn, BSAgE '82, MSE '92
Malik Sadiq, BSEE '88, MSIE '91, Ph.D. '93
Gopi Manogna Reddy Sirineni, MSEE '96

EARLY CAREER AWARDEES

Amanda Compean Day, BSChE '13
Asmaa Elkadi, Ph.D. '15
Steven J. Head, P.E., BSCE '10
Kyle David Kimpel, BSIE '06
Luke E. Osborn, BSME '12
Kyle C. Sligar, MSOM '13
Rusty Tate, P.E., BSBE '08, MSEnE '10

DAN WILLIAMS
B.S.C.E. 1981 | President and Chief Executive Officer, Garver (retired)
Chair of the Engineering Dean's Advisory Council

"It is my honor to serve as chair of the Dean's Advisory Council during such an important time in the College's history. I've had the pleasure of working with Dean English for several years, and he has accomplished a tremendous amount during his time with the College. Since he joined us in 2013, we've seen our enrollment grow significantly, our research enterprise has boomed and there is a renewed focus on diversity, equity and inclusion in the College. We were also fortunate to bring Campaign Arkansas to a successful conclusion, raising more than $70 million to support students, staff and faculty in the College of Engineering. That level of support is truly transformational, and the scholarships, faculty chairs and capital projects made possible by the campaign will shape the face of the College for years to come. We wish Dean English all the best as he becomes Vice Chancellor English and assumes leadership of the University of Arkansas' research and innovation efforts. I'm thrilled he will be able to translate the successes of the College of Engineering to the institutional level.

I'm also thrilled to be welcoming Kim LaScola Needy as the College's new dean. Dean Needy has a long track record of success in both private industry and in academia, and her skillset uniquely positions her to capitalize on the momentum in our College. The work of engineers and computer science in shaping the future of our world has never been more critical. COVID-19 taught us the importance of the skillsets our students learn every day – both the need for advanced technical expertise, and the critical thinking skills to be flexible and adaptable in the face of complexity.

I look forward to what's ahead for our College, and together, we can support the outstanding students, faculty and staff who move it forward every day."

The Civil Engineering Research and Education Center broke ground in 2019, and work continues for an estimated Fall 2021 opening.

CEREC

The first phase of construction will consist of a 34,700-square-foot lab space including a high-bay lab, strong floor and overhead crane. The high-bay lab is the cornerstone of CEREC, allowing large-scale testing of steel, timber, and concrete structures within a controlled environment.

The space will also allow the College of Engineering to better serve as a research partner for structural industries and agencies throughout the state of Arkansas and the region to drive innovation and solve current structural problems faced across the state, region, and nation.

RIBBON CUTTING

Téa Williams (BSEE '02, MSEE '04), Texas Instruments vice president and general manager for amplifier products, cuts the ribbon on the newly renovated circuits lab in Bell Engineering Center. Leaders from Texas Instruments and the University of Arkansas gathered in fall 2019 for a ribbon-cutting ceremony to celebrate the new space.

Renovation Investment

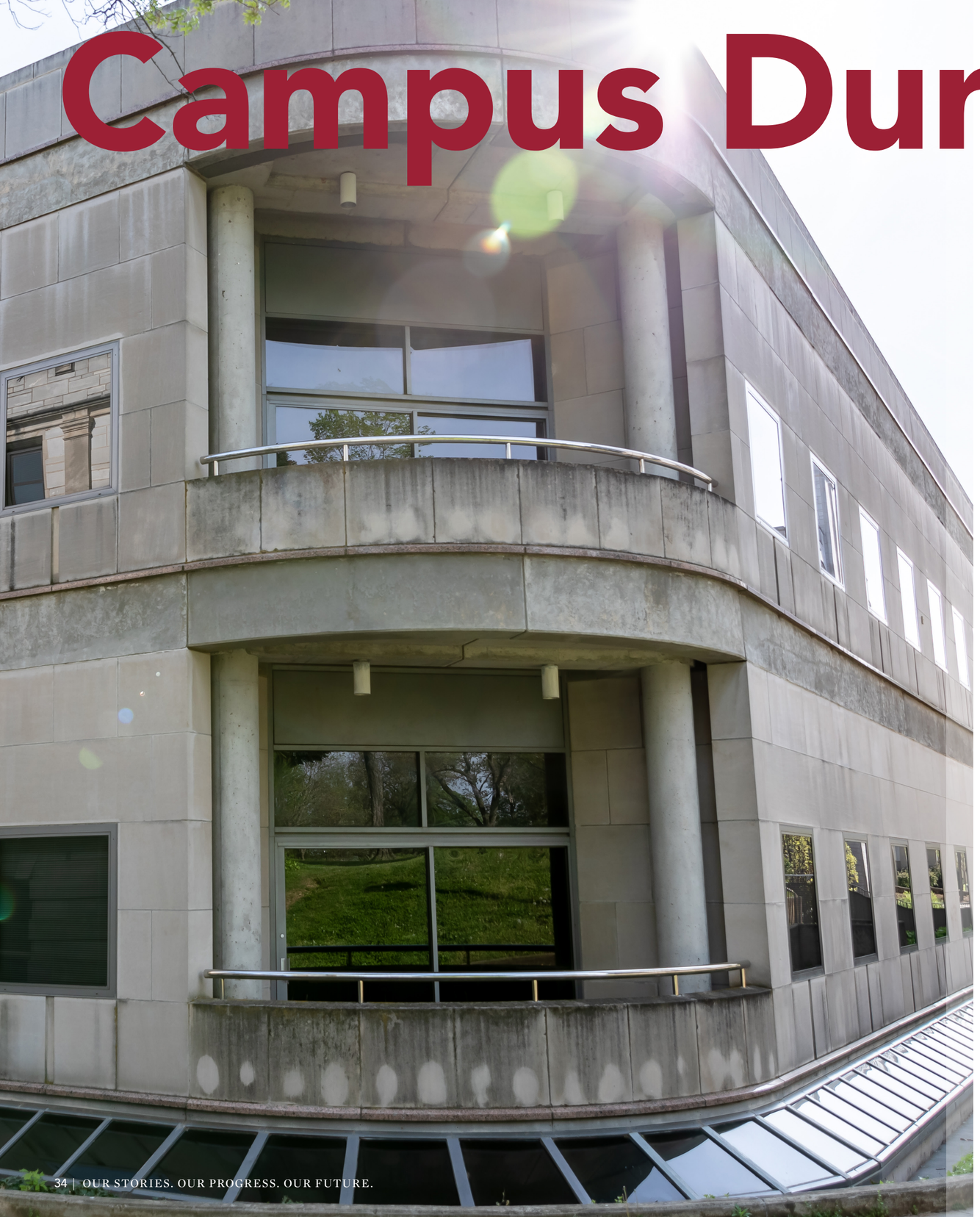
	2020
Academic	$88,000
Research	$980,000

Renovated Space

	2020
Academic	25,544 ft²
Research	7,286 ft²

Total Space

	2020
Academic	78,412ft²
Research	105,990ft²



Campus During COVID

College of Engineering Key Dates

March 16: Remote classes begin.

March 19: All employees whose jobs don't require being on campus begin working remotely. The Board of Trustees votes to postpone or cancel all commencement exercises at system campuses, and the U of A moves the in-person commencement to join the fall commencement.

March 21: The departments of biomedical engineering, biological sciences and nursing gather lab supplies and personal protection equipment to give to UAMS. The Arkansas National Guard, including university students and staff members, is called up to help with testing in Central Arkansas.

March 25: Justin Zhan, a professor of data science, collaborates with UAMS professors to predict genomic variation trends of the coronavirus.

April 2: The U of A donates medical and testing supplies to UAMS help COVID response.

April 3: University summer camps are canceled and all summer classes will continue to be taught remotely.

April 17: Researchers work to customize aerosol boxes for Washington Regional.

April 24: A team or researchers develops easy-to-produce ventilators for COVID-19 patients.

May 4: The Board of Trustees approves a plan to process and distribute $7.7 million in student aid to University of Arkansas students. The board also approves a resolution of intent to have on-campus classes in the fall.

May 12: Research activity resumes with safety measures in place.

May 14: Engineers use a 3D Printer to produce protective masks for a local rehab clinic.

June 3: Researchers develop a long-lasting disinfecting spray to be used on high-touch surfaces.

June 29: U of A researchers explore ways to clean single-use PPE for reuse.

July 16: A Researcher studies whether sewage can help track COVID-19.

August 24: Classes begin for the fall semester with remote, hybrid and face-to-face instruction.

Visit the University of Arkansas' "Determined to Help" website at uark.edu/determined to read more about the work of College of Engineering faculty, staff and students!

SCAN ME

Appendix

Revenues (excluding gifts)

	FY 2016		FY 2017		FY 2018		FY 2019		FY 2020	
State Appropriations & Tuition	$22,948,204	48.42%	$24,090,402	45.49%	$25,976,864	44.44%	$26,938,648	44.45%	$28,339,317	42.44%
Distance Learning Revenues, Ft. Smith, Service Centers, Conferences	$3,325,452	7.02%	$3,362,663	6.35%	$3,381,904	5.79%	$3,457,200	5.70%	$3,638,395	5.45%
Research Incentive Funds	$1,077,827	2.27%	$953,566	1.80%	$1,297,597	2.22%	$1,116,012	1.84%	$1,544,040	2.31%
Biological Engineering Teaching and Agricultural Experiment Station*	$1,893,397	4.00%	$1,898,336	3.58%	$1,974,884	3.38%	$2,031,850	3.35%	$1,937,982	2.90%
Sponsored Research (actual expenditures)**	$18,372,457	38.77%	$19,057,463	35.99%	$22,026,629	37.68%	$22,961,598	37.88%	$27,183,404	40.71%
Sponsored Activities and Scholarships (actual expenditures)	$1,658,126	3.50%	$900,368	1.70%	$1,002,185	1.71%	$1,166,060	1.92%	$1,095,756	1.64%
Student Equipment Fee Revenues (TELE-net)	$2,436,534	5.14%	$2,689,449	5.08%	$2,794,429	4.78%	$2,937,985	4.85%	$3,038,459	4.55%
Total	**$51,711,997**	**100%**	**$52,952,247**	**100%**	**$58,454,492**	**100%**	**$60,609,353**	**100%**	**$66,777,353**	**100%**

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

Expenditures (excluding gifts)

	FY 2016		FY 2017		FY 2018		FY 2019		FY 2020	
Salary and Benefits	$18,211,503	35.70%	$21,296,537	38.41%	$23,132,313	37.80%	$22,933,705	37.05%	$21,314,781	33.29%
Operating Expenditures	$1,149,449	2.25%	$922,571	1.66%	$980,572	1.60%	$918,842	1.48%	$705,760	1.10%
Dept Restricted Fees/Misc	$1,121,038	2.20%	$975,285	1.76%	$1,263,733	2.06%	$1,404,434	2.27%	$1,063,079	1.66%
Student Equipment Fees	$2,082,936	4.08%	$2,137,758	3.86%	$2,908,138	4.75%	$3,013,000	4.87%	$2,776,490	4.34%
Scholarships	$482,364	0.95%	$343,444	0.62%	$468,273	0.77%	$162,903	0.26%	$266,215	0.42%
Research*	$27,966,133	54.82%	$29,770,215	53.69%	$32,452,297	53.02%	$33,463,296	54.06%	$37,894,740	59.19%
Total Expenditures	**$51,013,423**	**100%**	**$55,445,810**	**100%**	**$61,205,326**	**100%**	**$61,896,181**	**100%**	**$64,021,065**	**100%**

**NSF expenditures report generated by Research Accounting*

Appendix

Gifts and Endowments*

Revenue	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020
Contributions - Expendable	$1,390,103	$1,310,687	$2,224,552	$2,489,203	$1,692,987
Contributions - Endowed & Restricted Gifts	$1,303,521	$948,276	$973,871	$1,807,863	$2,943,062
Investment Income					
Expendable	$2,816,073	$2,969,366	$3,020,637	$3,302,513	$3,431,893
Endowed (reinvestment)	$0	$0	$0	$0	$0
Endowed Market Value Adjustment	($4,280,657)	$6,814,020	$3,766,783	$958,043	($2,699,629)
Net Transfers and Allocations	$0	$0	$0	$0	$0
Total Revenue	**$1,229,040**	**$12,042,349**	**$9,985,843**	**$8,557,622**	**$5,368,313**

Expenditures	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020
Scholarships and Student Support	$621,766	$621,152	$829,507	$1,420,488	$1,338,430
Other College Support	$2,002,086	$2,496,899	$2,435,864	$3,036,918	$2,690,319
Capital Outlays	$187	$7,231	$1,401	$45,962	$124,342
Development costs**	$131,177	$233,808	$176,264	$209,251	$223,756
Total Expenditures	**$2,755,216**	**$3,359,090**	**$3,443,036**	**$4,712,619**	**$4,376,847**
Revenues less Expenditures	**($1,526,176)**	**$8,683,259**	**$6,542,807**	**$3,845,003**	**$991,466**

** 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 2016	FY 2017	FY 2018	FY 2019	FY 2020
Cash and Cash Equivalents - Expendable	$12,807,764	$14,109,710	$14,336,491	$16,211,431	$18,476,605
Pooled Investment Funds - Endowments	$52,164,081	$55,345,454	$59,765,483	$60,931,588	$59,895,188
Scholarship Endowments	$13,770,926	$14,516,478	$15,591,733	$16,096,272	$15,930,455
Fellowship Endowments	$4,292,359	$4,934,397	$5,729,113	$6,028,533	$5,957,040
Total Fund Balances	**$83,035,130**	**$88,906,039**	**$95,422,820**	**$99,267,824**	**$100,259,288**

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

Appendix

Distance Education

Master of Science in Operations Management

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.

Year	Number of Courses Offered	Student Credit Hours
2016	31	9,243
2017	32	8,748
2018	33	7,600
2019	32	7,701
2020	33	8,397

Master of Science in Engineering

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*.

Year	Number of Courses Offered	Student Credit Hours
2016	67	1,677
2017	76	1,527
2018	75	1,821
2019	78	2,049
2020	78	2,058

Master of Science in Engineering Management

The Master of Science in Engineering Management program provides leadership and business skills to manage technology teams. The program is designed for engineers with bachelor's degrees who want to move into leadership positions in engineering organizations.

Year	Number of Courses Offered	Student Credit Hours
2018	81	477
2019	83	432
2020	83	690

Appendix

Faculty Elected as Fellows of Professional Societies

American Concrete Institute
Frances Griffith
Micah Hale

American Institute for Medical and Biological Engineering
Jin-Woo Kim
Yanbin Li
Lalit Verma

American Institute of Chemical Engineers
Tom Spicer
Ranil Wickramasinghe

American Society for Engineering Education
Norman Dennis
Kim Needy

American Society for Engineering Management
Heather Nachtmann
Kim Needy
Edward Pohl

American Society of Agricultural and Biological Engineers
Yanbin Li
Lalit Verma

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

American Society of Mechanical Engineers
Rick Couvillion
Steve Tung
Min Zou

ASHRAE
Darin Nutter

Indian Society of Agricultural Engineers
Lalit Verma

Institute for Operations Research and Management Sciences
Greg Parnell

Institute of Biological Engineering
Yanbin Li
Lalit Verma

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

Institute of Engineering and Technology (UK)
Omar Manasreh

Institute of Industrial and Systems Engineers
Richard Cassady
John English
Haitao Liao
Heather Nachtmann
Kim Needy
Edward Pohl
Manuel Rossetti

National Academy of Engineering
Mike Johnson

International Academy of Agricultural and Biosystems Engineering
Lalit Verma

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
Juan Carlos Balda
Hameed Naseem

Society of American Military Engineers
Mike Johnson

Society of Decision Professionals
Greg Parnell

Society of Reliability Engineers
Richard Cassady
Edward Pohl

Society of Tribologists and Lubrication Engineers
Min Zou

Appendix

College of Engineering Administrative Contacts

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Engineering Dean's Advisory Council

Daniel Williams, *Council Chair*
President & CEO (retired)
Garver, LLC

Gregory Baltz, Sr.
Founder & President
Running Lake Farms

Scott Bennett
Director (retired)
Arkansas Department of Transportation

Kevin W. Brown
Chairman Emeritus
Executive Advisory Council
RLG International, Inc.

Alan D. Fortenberry
CEO (retired)
Beaver Water District

Robert S. Harrison
Vice President & Principal
ECCI

David Humphrey
Vice President, Investor Relations
ArcBest

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

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

W. Kent McAllister
President of Projects
Wood - Americas

Pamela McGinnis
President of Global Marketing
Phillips 66

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

Adam Monroe
Biotechnology Executive

Tom L. Pierson
Founder & CTO
TAS Energy, Inc.

Malik Sadiq
President, Internal Growth & Business Optimization
Tyson Foods, Inc.

Patrick Schueck
President
Lexicon, Inc.

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

Thad Solomon
Chief Operating Officer
Steel Technologies

Ami Spivey
Senior Vice President, Next Generation Supply Chain (retired)
Walmart, Inc.
President/ CEO
Powering Forward Consulting

Chuck Tilmon
Vice President, Quality Control
Walmart, Inc.

Chris Weiser
Owner & CEO
J. V. Manufacturing, Incorporated

Bruce Westerman
Congressman

Lang Zimmerman
Vice President
Yelcot Communications

Emeritus, Executive Committee

Melinda Faubel
Director of External Affairs
AT&T Arkansas

Charles Zimmerman
President & Owner
Global VE


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