

**Fulton Schools of Engineering**

# **2019 Arizona Pavements/Materials Conference**



**Kyle Squires**

# The ASU model for university innovation

Guided by eight design aspirations to achieve Access, Excellence and Impact

- Value entrepreneurship
- Be socially embedded
- Conduct use-inspired research
- Engage globally
- Leverage our place
- Enable student success
- Transform society
- Fuse intellectual disciplines

## Mission

- Demonstrate **leadership in academic excellence** and **accessibility**
- **Establish national standing** in academic quality and impact of colleges and schools in every field
- Establish ASU as a **leading global center for interdisciplinary research, discovery and development**
- **Enhance** local **impact** and social embeddedness

*How do we simultaneously enable access as well as drive research performed at the highest levels?*



# #1



## in the U.S. for innovation

**ASU ahead of Stanford and MIT**  
**– U.S. News & World Report**  
**5 years, 2016–2020**

## ASU Charter

ASU is a comprehensive public research university, measured not by whom it excludes, but by **whom it includes** and how they succeed; advancing **research and discovery of public value**; and assuming fundamental **responsibility for** the economic, social, cultural and overall health of **the communities it serves**.

**What does access,  
excellence and impact  
look like in an  
engineering school?**



# Fulton Schools of Engineering

*The largest and most comprehensive engineering college in the United States*

## Interdisciplinary structure

6 schools  
2 campuses + online  
Cross-campus partnerships  
with arts, business,  
sustainability, sciences

## Research and innovation

\$115M in FY2019  
Lead two NSF ERCs  
(partner on two others)  
Lead DHS Center for  
Accelerating Operational  
Efficiency

## Academic programs

25 undergraduate degree  
programs  
44 graduate programs  
23,903 students  
(7,062 online)  
4,823 graduates  
across all degree levels

## Entrepreneurial outputs

192 patents  
24 startups  
in the last three years

## Faculty

~355 tenured/tenure-track  
faculty  
~100 lecturers and  
professors of practice  
29 young investigator awards  
over the past four years

## Global capacity-building programs in Vietnam and Pakistan

# Measures of FSE evolution since 2009

## Total enrollment

**6,407**

Fall 2009

**23,903**

Fall 2019

## Undergraduates

**4,253**

Fall 2009

**18,942**

Fall 2019

## Graduates

**2,154**

Fall 2009

**4,961**

Fall 2019

## Degrees granted

**1,391**

2008-2009

**4,532**

2018-2019

## Research expenditures

**\$73M**

FY2009

**\$115M**

FY2019

## T/TT faculty

**214**

Fall 2010

**355**

Fall 2019

21% increase in awards in 2018-2019

# Our Edge: The Fulton Difference



- More than traditional coursework
- Emphasis on experiential learning opportunities across the curriculum
- Mindset as master learners in intrapreneurial and entrepreneurial connections

Impacting our community, region and world

**Scale:** More than **125,000 master learners** across five campuses at the nation's largest public research university.

**Quantity and quality:** Nearly 24,000 students in the Ira A. Fulton Schools of Engineering including **222** National Merit Scholars, **205** National Hispanic Scholars, **one-third** of the Honors College

**Faculty excellence:** Fulton Schools faculty have received **29 National Science Foundation Career Awards** over the last four years.



## Broadening participation

**4,300 International**

**5,200 Underrepresented**

**5,300 Female**



# More than a degree

Students can develop skills - leadership, mentoring and public speaking - outside the classroom.

[customize.engineering.asu.edu](https://customize.engineering.asu.edu)



Peer Mentors



eProjects and capstones



Student organizations



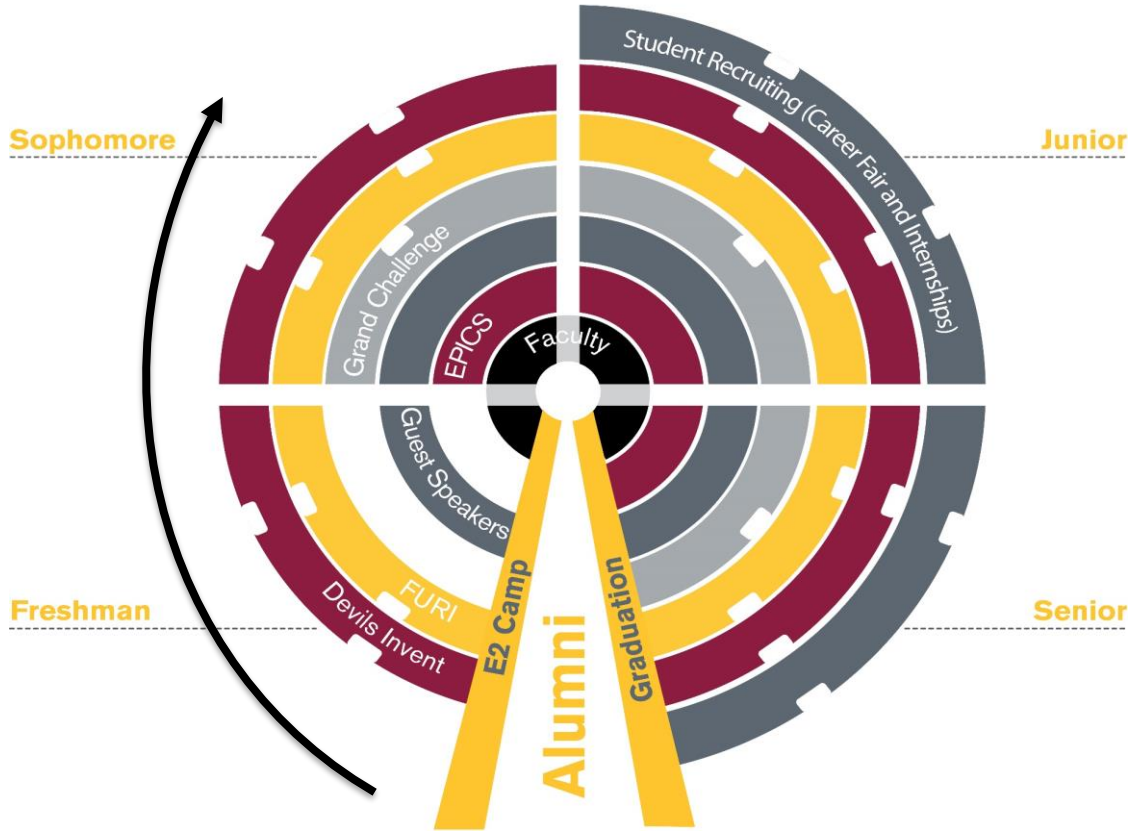
Undergraduate research

# Engaging across the student experience

From E2 Camp through graduation

Building brand awareness throughout the experience

Student projects...events ...  
...guest speakers...  
hackathons...research ...  
faculty engagement ...  
scholarships ... internships ...  
recruitment ... and other events



# Fulton Schools Research – 2019



Early stage discovery	Translational research	Mission-focused impact
<p><b>35+ young investigator awards</b> from NSF CAREER, AFOSR YIP, DARPA YFA, ONR YIP, NASA and NIH over past three years.</p> <p>More than <b>\$44M awards for 19 DARPA projects</b> in last two years supporting areas such as biological technologies, microsystems, &amp; complex remote systems.</p>	<p><b>NSF Engineering Research Centers:</b> Leading <b>QESST &amp; CBBG</b> plus partnering on <b>NEWT &amp; FREEDM</b></p> <p><b>NSF I/UCRCs</b> (Industry/University Cooperative Research Programs): PSERC, Connection One, SenSIP, WET, Center for Embedded Systems, Efficient Vehicles and Sustainable Traffic Systems, BRAIN</p> <p><b>Launched new Clinical &amp; Industry collaborations:</b> ASU-Mayo Center for Innovative Imaging</p> <p>Science and Technology Demonstration Centers (Wearable devices, Blockchain)</p> <p>Continued 20+ years <b>SRP</b> relationship with \$2.5M annual funding</p>	<p>\$18 million from <b>USAID</b> to establish the U.S.-Pakistan Centers for Advanced Studies in Energy (USPCASE) to improve power production in Pakistan</p> <p>Lead <b>DHS Center for Accelerating Operational Efficiency</b>. CAOE develops and applies advanced analytical tools and technologies to enhance planning, information sharing and real-time decision-making in homeland security operations.</p> <p>Lead <b>DOT Tier 1 University Transportation Center - Teaching Old Models New Tricks (TOMNET)</b></p>

~350 tenured and tenure-track faculty + 50 research faculty + > 100 post-docs + > 1200 PhD students

# Entrepreneurship and innovation

Responsible for 192 patents and  
24 startups in the last three years

## #3 Licenses and options

Behind only Purdue and Carnegie Mellon

## #4 IP disclosures

Behind only Carnegie Mellon, Caltech and Purdue

## #4 Startups

Behind only Purdue, Carnegie Mellon and Stanford

Comparative data per \$10 million in research expenditures, based on the Association of University Technology Managers annual report of top national engineering schools.



# Building engineers, inspiring innovators

## OUR TRANSDISCIPLINARY PARTNERS AT ASU

- School of Arts, Media and Engineering  
Herberger Institute for Design and the Arts
- School of Earth and Space Exploration  
College of Liberal Arts and Sciences
- The Biodesign Institute  
College of Integrative Sciences and Arts

- Global Security Initiative
- School for the Future  
of Innovation in Society
- Julie Ann Wrigley Global  
Institute of Sustainability
- W. P. Carey School of Business

### School of Biological and Health Systems Engineering

Marco Santello, Director

**864 students**  
707 undergraduate  
157 graduate

- Biomedical engineering
- Biological design

### School of Computing, Informatics, and Decision Systems Engineering

Sandeep Gupta, Director

**7,773 students**  
5,901 undergraduate  
1,872 graduate

- Computer engineering
- Computer science
- Computer systems engineering
- Engineering management
- Industrial engineering
- Informatics
- Robotics and autonomous systems
- Software engineering

### School of Electrical, Computer and Energy Engineering

Steve Phillips, Director

**3,353 students**  
2,369 undergraduate  
974 graduate

- Computer engineering
- Electrical engineering
- Robotics and autonomous systems

### School for Engineering of Matter, Transport and Energy

Lenore Dai, Director

**3,860 students**  
3,153 undergraduate  
707 graduate

- Aerospace engineering
- Chemical engineering
- Materials science and engineering
- Mechanical engineering
- Robotics and autonomous systems
- Solar energy engineering and commercialization

### School of Sustainable Engineering and the Built Environment

Ram Pendyala, Interim Director

**1,771 students**  
1,380 undergraduate  
391 graduate

- Civil engineering
- Construction engineering
- Construction management
- Environmental engineering
- Sustainable engineering

### The Polytechnic School

Leila Ladani, Director

**5,858 students**  
5,422 undergraduate  
436 graduate

- Aeronautical management technology
- Engineering
- Engineering education systems and design
- Environmental and resource management
- Graphic information technology
- Human systems engineering
- Information technology
- Manufacturing engineering
- Robotics and autonomous systems
- Technological entrepreneurship and management
- User experience

Fall 2019 Enrollment

**25 undergraduate programs ■ 44 graduate programs ■ 2 campuses+online**

# Producing talent

Supply of graduates helps fuel Phoenix being named #3 city for tech jobs (TIME Money June 2017)

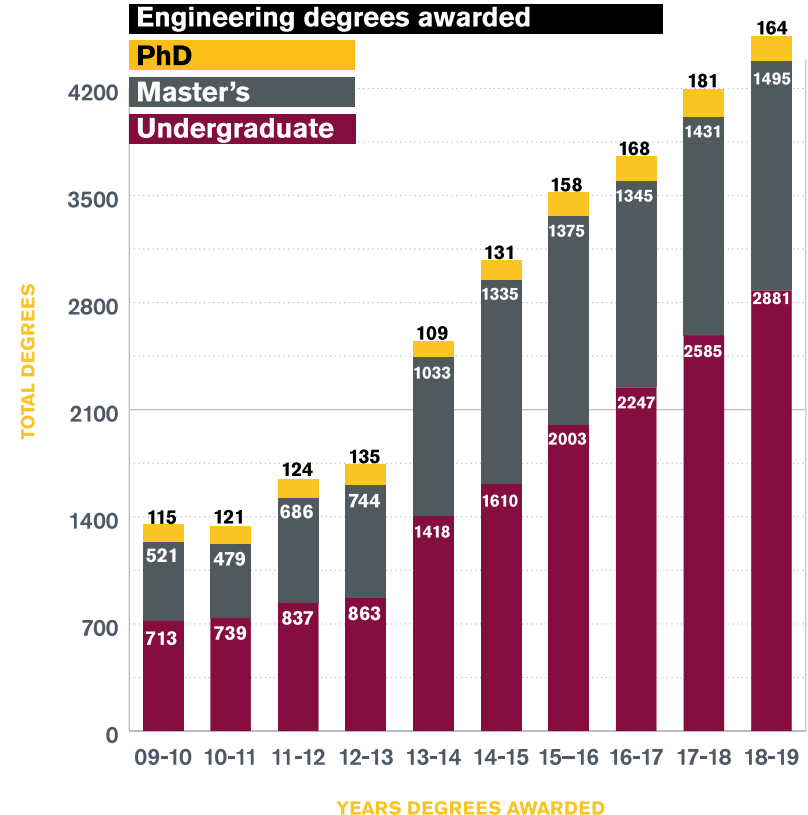
#5 for bachelor's degrees granted in U.S., up two positions.

#8 for bachelor's degrees granted to Hispanics, up 1 position.

#13 for bachelor's degrees granted to women, up 5 positions.

Rankings from 2018 American Society for Engineering Education Profiles

## Degrees granted





**65%**

of children entering primary school today will ultimately end up **working in completely new job types** that don't yet exist.

# Learning Pathways for Future Workforce

## Open Courses

- Not for university credit
- Online, self-paced learning on demand
- Developed by ASU faculty
- Low to no cost
- Purpose is to upskill around specific competencies
- Goal is to introduce technical topics and provides pathways to other credentials
- 8-20 hours per course
- 4-6 open courses can lead to a specialization

## Short Courses

- Not for university credit
- Agile training options delivered in various modalities
- Industry relevant topics
- Developed and taught by ASU faculty and industry experts
- Purpose is to upskill around specific competencies with increased rigor & engagement
- Goal is to enable learner to rapidly apply content knowledge and build in-demand skills
- 20-40 hours

## Professional Certification

- Not for university credit
- Agile training options delivered in various modalities
- Industry relevant topics
- Taught by ASU faculty and industry experts
- Industry-relevant projects
- FSE-recognized professional certification
- Purpose is to upskill around specific competency via completion of a project
- Goal is to provide real-world application to professionals seeking a high impact return
- 3-6 months

## Undergraduate

- Earn university credit
- Enhanced courses focus on relevant topics
- Faculty engagement and feedback
- Taught by ASU faculty
- Accredited programs
- Financial aid
- Condensed 7.5 week format possible
- Transfer pathways
- 120 credits completed over 4-6 years to earn a degree

## Graduate

- Earn university credit
- Enhanced courses specialized on relevant topics
- Faculty engagement and feedback
- Taught by ASU faculty
- Accredited programs
- Financial aid
- Unique assessments based on graded assignments, exams and applied projects
- 10 courses completed over 2-4 years to earn a degree
- 5 courses completed to earn a graduate certificate

**Modes of Delivery: Online, Classroom, Hybrid, On-Site**

**Value Proposition: Global Alumni Network, Career Resources, 24/7 Learner Support, Focused on Student Success**





# Partnership...

**Accelerating** research outcomes whether an undergraduate student, graduate student, or industry partner

**Leveraging** our faculty, our size and our community to advance partner capacity and technical talent

**Building** communities of practice across industry, universities and organizations

An abstract graphic on the left side of the slide, consisting of a complex network of thin grey lines connecting various points, creating a wireframe structure that resembles a stylized, multi-faceted object or a network diagram.

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