

NEW MEXICO STATE UNIVERSITY COLLEGE OF ENGINEERING 2020 ANNUAL PROGRESS REPORT



BE BOLD. Shape the Future.
College of Engineering

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NEW MEXICO STATE UNIVERSITY LEADS 2025



BE BOLD. Shape the Future.
New Mexico State University
nmsu.edu



Mission

The mission of the New Mexico State University system is to serve the diverse needs of the state through comprehensive programs of education, research, extension and outreach, and public service. As the state's land-grant and space-grant university and as an Hispanic-Serving Institution, NMSU fosters learning, inquiry, diversity and inclusion, social mobility and service to the broader community.

Vision

By 2025, the NMSU system will excel in student success and social mobility for our diverse student populations, achieve the highest Carnegie research status (R1), and maintain our Carnegie Community Engagement classification.

Values: NMSU 2025 LEADS

Leadership: Promoting and creating the ability for Aggies to shape the future

Excellence: Providing the highest level of education, research, outreach and service

Access: Welcoming diverse populations to higher education and to the NMSU community

Diversity and Inclusion: Embracing our differences as an asset and actively seeking to include wide-ranging perspectives

Student-Centered: Supporting the education of our students through every aspect of our university, every day

These values are encapsulated as: **BE BOLD. Shape the future.**

COLLEGE OF ENGINEERING STRATEGIC ROADMAP



College of Engineering Peer Institutions

Selection Criteria: Carnegie classification, size of college, ascent in rankings

- ⇒ New Mexico State University
- ⇒ University of Arizona, Tucson
- ⇒ Texas Tech University, Whitacre
- ⇒ Florida International University
- ⇒ Oklahoma State University
- ⇒ Kansas State University
- ⇒ University of New Mexico
- ⇒ University of Nevada, Reno
- ⇒ University of Nevada, Las Vegas
- ⇒ Montana State University
- ⇒ University of Texas, San Antonio
- ⇒ Utah State University

COLLEGE OF ENGINEERING STRATEGIC ROADMAP



Guiding Principles

The College of Engineering 2025 roadmap is intended to be a continuous improvement plan embraced by all faculty and staff members of the college. Its goals and objectives provide guidance for the next steps toward fulfilling the mission and vision of New Mexico State University.

The content presented in this document was planned in various stages and was developed and contributed to by all constituents of the college: faculty and staff, students, alumni, donors, industry representatives and NMSU administration. A committee with representation from each department, faculty and staff surveys, comment sessions, the College of Engineering Fact Book, and U.S. News and World Report data on peer institutions, were used in preparation of this document.

It is comprehensive and designed so that all faculty and staff members will be familiar with it and contribute to its objectives while conducting the business of the college. Departments will align their strategic plans with this roadmap.

The College of Engineering administrative team will be intentional in assessment of progress toward fulfilling the KPIs in this plan. Annual evaluations, as well as promotion and tenure documentation, will be aligned with this document, just as this strategic plan is aligned with the university-level plan.

COLLEGE OF ENGINEERING STRATEGIC ROADMAP

STEERING COMMITTEE

- ⇒ Antonio Garcia
- ⇒ Gabe Garcia
- ⇒ Rolfe Sassenfeld



Students in the Aggie Innovation Space test a robotic arm.

GOAL 1. ENHANCE STUDENT SUCCESS AND SOCIAL MOBILITY

The College of Engineering is committed to student success through relevant programs, degree completion and career attainment. Our students are served by our culture of inclusivity and educational delivery that meets student needs and includes online and hands-on learning. We believe that providing students with interpersonal skills, entrepreneurial ideas and leadership abilities is essential to the education of engineering students.

Objective 1.1: Provide innovative and relevant educational and research programs

Actions

- Identify programs that fulfill regional workforce needs, and match teaching and research interests and expertise of faculty members.
- Increase online presence and expand delivery modes of degree/certificate/training programs.
- Foster exposure to entrepreneurship through collaborative activities with Arrowhead Center.
- Develop students' inter- and intrapersonal skills through the Ron Seidel Engineering Leadership Academy and the Eloy Torrez Family Engineering Learning Communities programs.

Objective 1.2: Promote student success (3Gs – Get the degree, Get a job and Give back)

Actions

- Actively recruit undergraduate and graduate students in all program offerings.
- Improve student retention, time to completion and graduation rates.
- Establish industry partnerships to improve student placement.

COLLEGE OF ENGINEERING STRATEGIC ROADMAP

STUDENT-CENTRIC PROGRAMS

- ⇒ Thirteen students comprising the second cohort of students participating in the Ron Seidel Engineering Leadership Academy began in the fall 2020 semester.
- ⇒ More than \$12K in retention scholarships were provided to approximately 80 students in financial need during the 2019-'20 academic year.



Student organizations play an important role in providing experiential learning opportunities. These members of Aggies Without Limits spent eight months building a bridge for the Otero County Fairgrounds.

- d. Provide industry-driven, interdisciplinary opportunities for experiential learning to all students through internships, cooperative education and/or capstone projects.
- e. Continually examine, assess, document and revise academic progress and strategies to align with ABET requirements.

GOAL 1. KPIs

1. Interdisciplinary faculty clusters and industry leaders will be organized to assess and develop curricular and programmatic opportunities in relevant areas to include additive manufacturing, cybersecurity, autonomous systems, data and information science, bioprocessing, space and launch systems, and the nexus of food, energy and water systems.
2. Each department will offer at least one online certificate program.
3. The college will have a 5% increase of students each year.
4. At least 20% of the student body will comprise graduate students.
5. The college will rank in the top quartile of peer institutions for retention and graduation rates. Measures will be adjusted for post-MATH 191 students and students who have participated in internships and co-ops.
6. One hundred percent of engineering graduates will be employed or pursuing graduate degrees.
7. All students will have the opportunity to engage in experiential learning through capstone projects and/or Aggie Innovation Space activities.

2020 COLLEGE OF ENGINEERING GOAL 1 ACCOMPLISHMENTS



Student Retention Through Degree Completion

The 2016-2022 S-STEM grant led by Paola Bandini, associate professor of civil engineering, graduated the first cohort of 26 academically talented engineering students who received a combined total of \$581,304 in S-STEM scholarships, one-on-one faculty mentorship and professional development opportunities. In fall 2020, the project started the second S-STEM cohort.

Increase in lower-division student credit hours

While there was a 3% increase in freshman registration, actual enrollment of first-year students was a 1% increase in first year students by census day due to the global pandemic. Total enrollment in the College of Engineering was down slightly from 2,247 in fall 2019 to 2,207 students in fall 2020.

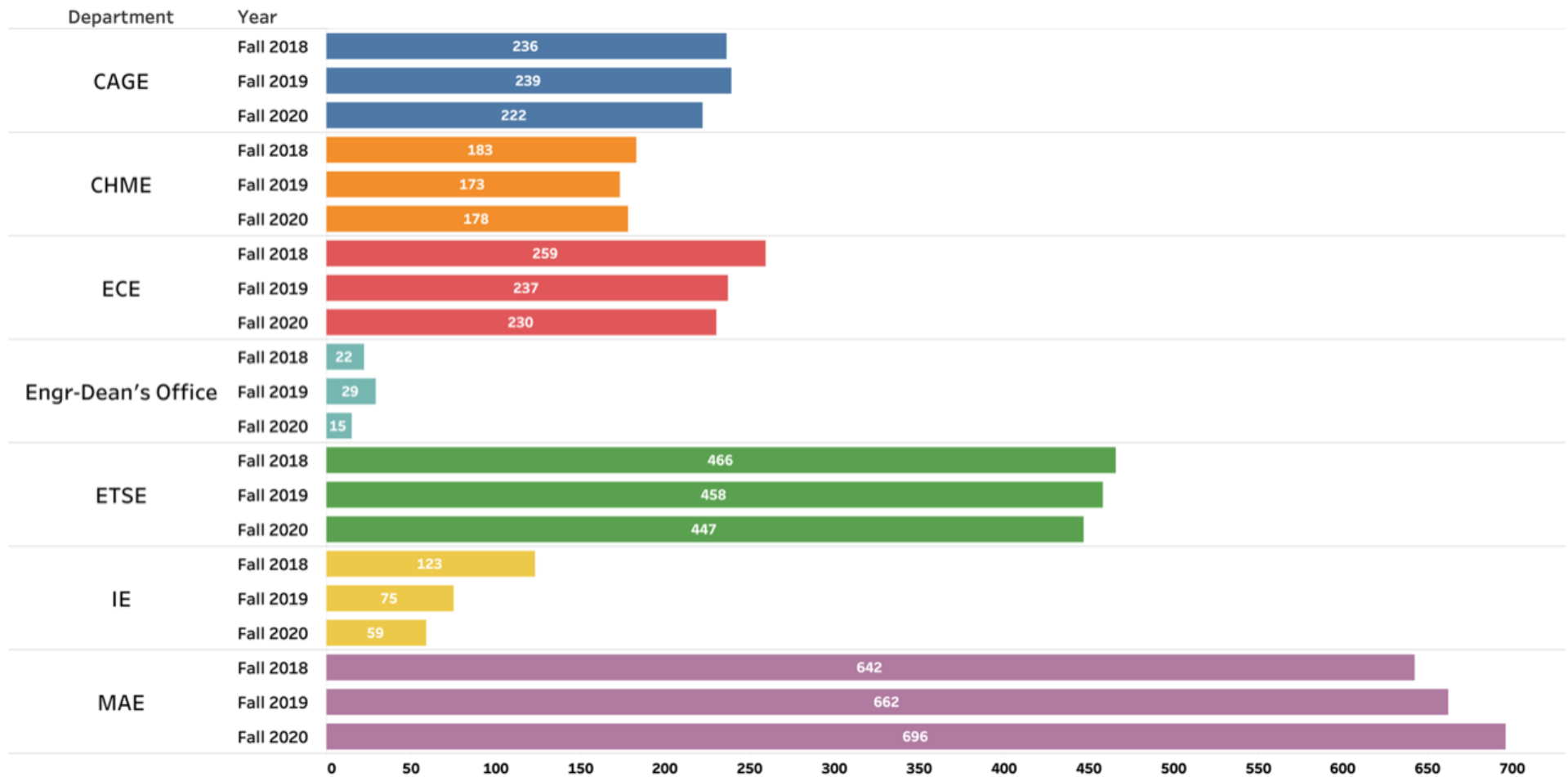
Even so, student credit hours in the lower division increased by 3.8% in fall 2020 and by 3% in spring 2021 indicating improvements in retention from first to second year.



S-STEM students in the classroom.

2020 COLLEGE OF ENGINEERING GOAL 1 ACCOMPLISHMENTS

Department Enrollment - Undergraduate



2020 COLLEGE OF ENGINEERING GOAL 1 ACCOMPLISHMENTS

HARDWARE-AT-HOME LAB KITS

During the pandemic, Wei Tang, associate professor of Electrical and Computer Engineering developed take-home lab kits for students in his EE300 Cornerstone class. The lab kits enabled students at home to have hands-on experience. The at-home lab kits have been demonstrated to be an effective tool for online learning, as evidenced by student evaluations.

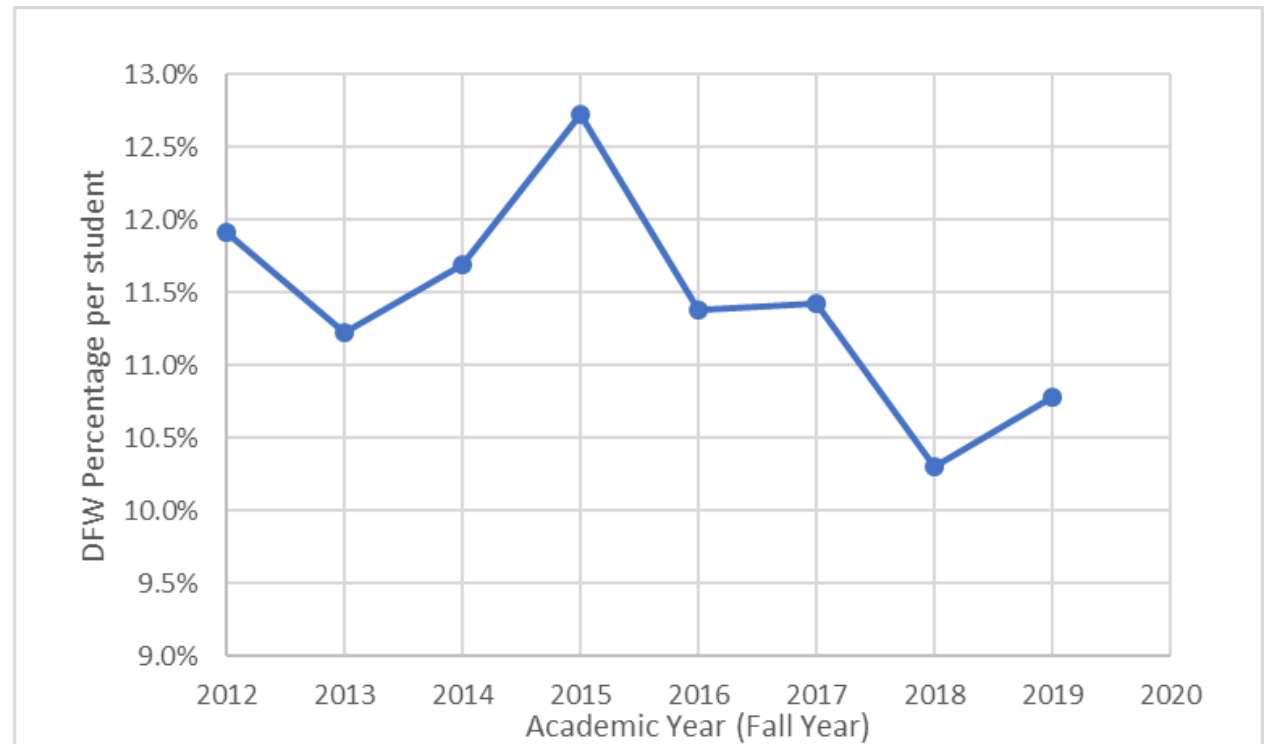


“The labs 100 % benefitted me in learning more skills that I may use toward my career.”

~Anonymous Student

Lower D/W/F rates

A key indicator for future enrollment and graduation numbers is a sustained reduction in D, W and F grades. The goal of the college is to consistently be below 10% of this key indicator. The graph below shows D/W/F grades as a percentage of students enrolled in engineering courses. Spring 2020 D/W/F grades dropped below 10% and spring 2021 grades are expected to achieve this target as well.



2020 COLLEGE OF ENGINEERING GOAL 1 ACCOMPLISHMENTS

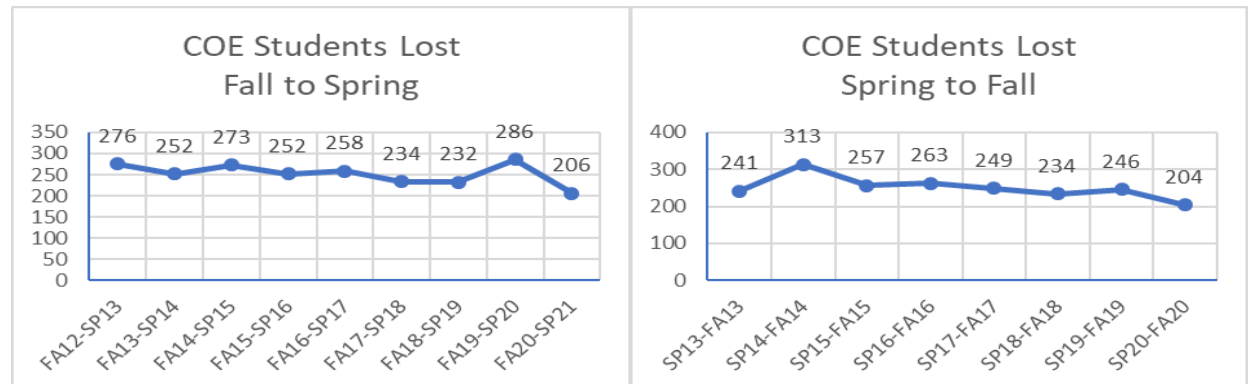


Sarah Blaeser, senior civil engineering student, is one of the Eloy Torrez Family Engineering Learning Center's Peer Learning Facilitators.

Curricular assessment to support student success

The College of Engineering studied and analyzed data to better understand student retention. First, student enrollments were tracked from fall to spring and spring to fall for the past seven semesters.

Next, we analyzed the transcripts of the 1,642 students who were lost during this period, revealing a high retention rate at the freshmen level but not at the junior level. The analysis shows that the average SCH for students lost is between 60-70 with the exception of ICT, which is around 90 credits. The ICT program is a 2+2 program, most students already having a degree. Many of these students are part-time so it is not uncommon for them sit out a semester or two and then return.



2020 COLLEGE OF ENGINEERING GOAL 1 ACCOMPLISHMENTS

INTRODUCTION OF PROFESSIONAL MASTER OF ENGINEERING

In 2020, the college introduced Professional Master of Engineering degrees in all departments. These are 30-hour, non-thesis degrees specifically designed to accommodate working professionals in a variety of engineering and technical fields. The Professional Master of Information Technology, launched in fall 2020, already has more than 50 students enrolled.

**All NMSU
College of
Engineering
programs
successfully
received
official ABET
accreditation in
2020.**

Evaluating causes for dropouts

The courses taken by the 1,642 students when they left the college reveals that although they were at the junior level in terms of credit hours completed, they were only at the freshmen level based on the courses in their curriculum. The table below shows the six courses that most students were enrolled in and failed in the semester they dropped out of engineering. The average fail rate of these courses is 71%. All of these courses are taught in departments outside of engineering and are prerequisites to several important engineering courses. Even those who passed these courses, succeeded only after multiple attempts, taking longer times for graduation.

Top Seven Courses Students Were Enrolled in at Time of Departure						
Course	No	Campus	Title	Total	% Pass	% Fail
CHEM	111G	MA	GENERAL CHEMISTRY I	220	34.09	65.91
MATH	121G	MA	COLLEGE ALGEBRA	162	24.69	75.31
MATH	190G	MA	TRIG AND PRE-CALCULUS	197	28.43	71.57
MATH	191G	MA	CALCULUS I	184	21.74	78.26
MATH	192G	MA	CALCULUS II	139	26.62	73.38
PHYS	215G	MA	ENGINEERING PHYS I	119	35.29	64.71
ENGR	100	MA	INTRO TO ENGINEERING	301	55.48	44.52

2020 COLLEGE OF ENGINEERING GOAL 1 ACCOMPLISHMENTS



College of Engineering Dean and NMSU Chancellor Dan Arvizu visit in the Eloy Torres Family Engineering Learning Communities. During the pandemic, facilitators continued to provide academic assistance to students via the internet. In the 2020-'21 academic year, more than 1,300 students utilized the center for in-person tutoring, online tutoring, computer lab usage, guided study sessions and doing homework or studying.

Solving the Math Problem

Mathematics courses remain the most difficult for engineering students out of the top six most difficult courses. MATH 190, 191, and 192 are the main courses that slow down engineering students' progress in their engineering curriculum and cause them to drop out. MATH 191 and 192 are prerequisites for engineering courses in almost every program. The result is, students complete their general education course requirements and are forced to take courses outside the engineering curriculum to maintain full-time enrollment. This accounts for many students having a high number of credits when they leave the college.

Using similar analyses on several courses in our programs, the following new initiatives were undertaken in 2020:

1. Design an engineering mathematics course, ENGR 190, to be taught within the College of Engineering, with essential mathematical concepts common to basic engineering courses. This would allow students to advance in the curricula with basic engineering courses without unnecessarily waiting to complete the advanced mathematics courses. It would also allow students to be better prepared when they begin taking advanced mathematics courses.
2. Eliminate the college-level "Introduction to Engineering" course and allow individual units to develop their own introductory courses.
3. Deploy more resources to basic engineering courses and move them to the teaching-centric Engineering Technology and Surveying Engineering Department.
4. Begin eliminating courses with overlapping content.

2020 COLLEGE OF ENGINEERING GOAL 1 ACCOMPLISHMENTS

ENGINEERING EDUCATION RESEARCH AWARDS

Olga Lavrova, Electrical and Computer Engineering; "Collaboration STEP2NLS with STEM Core-Successful Training and Effective Pipelines to National Laboratories with STEM Core; North Carolina Agricultural & Technical State University; \$129K

Steven Stochaj, Electrical and Computer Engineering; "New Mexico State University Educational Partnership with NASA/GSFC and WSC;" NASA/Johnson Space Center/White Sands Test Facility; \$118K

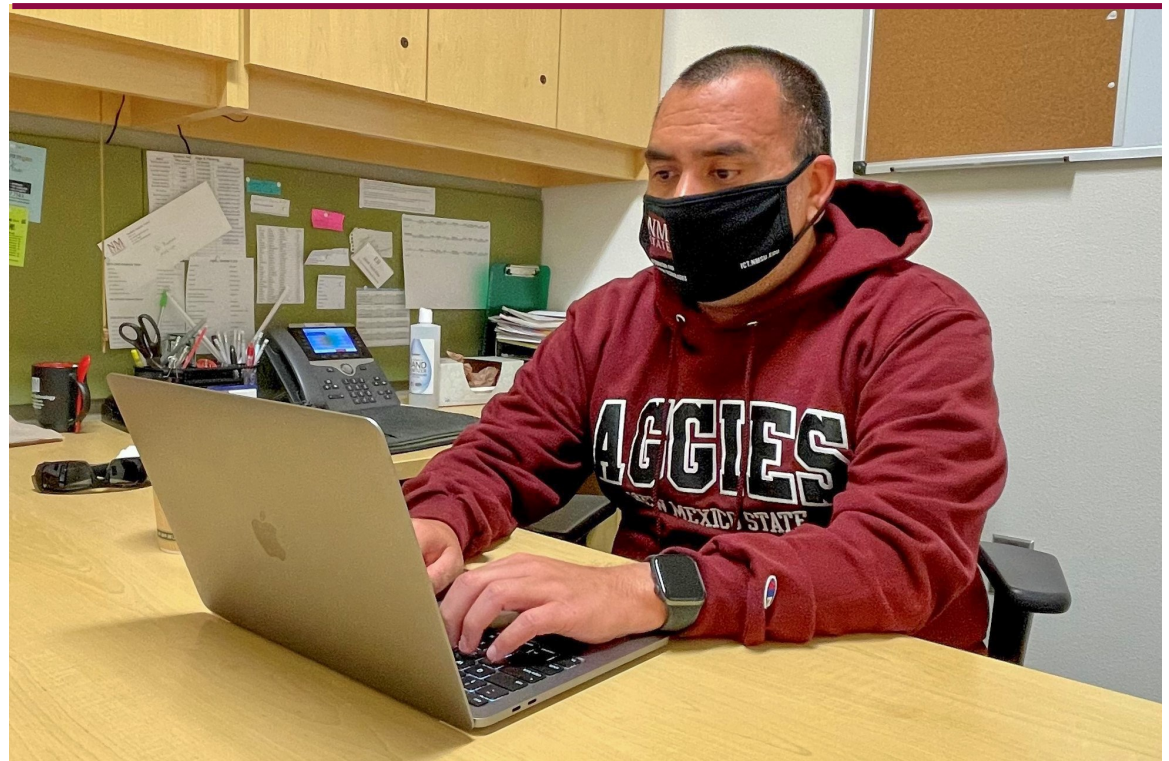
New Mexico Alliance for Participation; "NMSU Student Support Services Science, Technology, Engineering, Mathematics and Health Sciences;" US Department of Education; \$262K

Antonio Garcia, Engineering College; "Combing Andragogy and Pedagogy to Help First-Generation, Low-Income Students Succeed in Engineering;" National Science Foundation; \$2.4M

Muhammed Dawood, Electrical and Computer Engineering; "Two-to-Four-Year Pathway for Successful Transfer and Retention of Engineering Students;" National Science Foundation; \$3.8M

Increase graduate enrollment

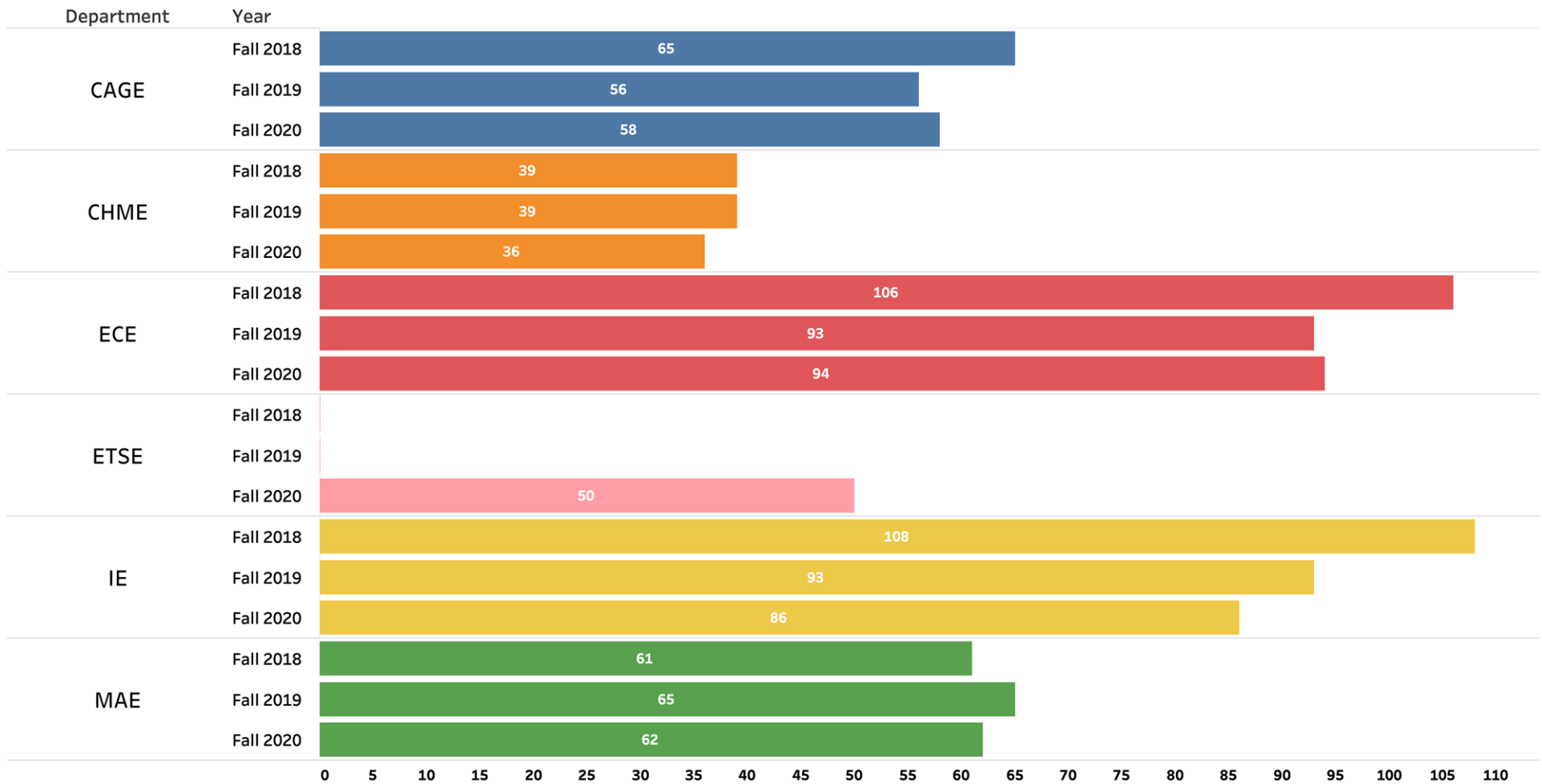
Graduate enrollments increased 12% over last year. This may be attributed to the establishment of new online professional master's programs, particularly the new online Professional Master of Information Technology, and an expansion of mechanical engineering offerings. Professional master of engineering degrees are 30-hour, non-thesis programs specifically designed to accommodate working professionals in a variety of engineering and technical fields. Many courses are offered online or in the evening.



Professional Master of Information Technology student Eli Ramos programs a mobile application.

2020 COLLEGE OF ENGINEERING GOAL 1 ACCOMPLISHMENTS

Department Enrollment—Graduate

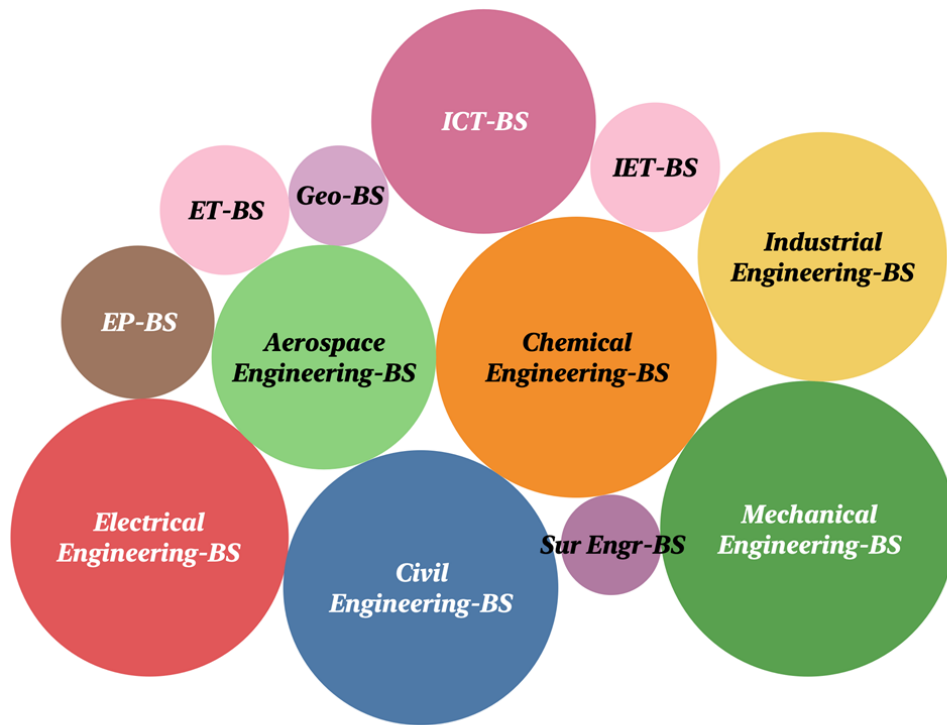


2020 COLLEGE OF ENGINEERING GOAL 1 ACCOMPLISHMENTS

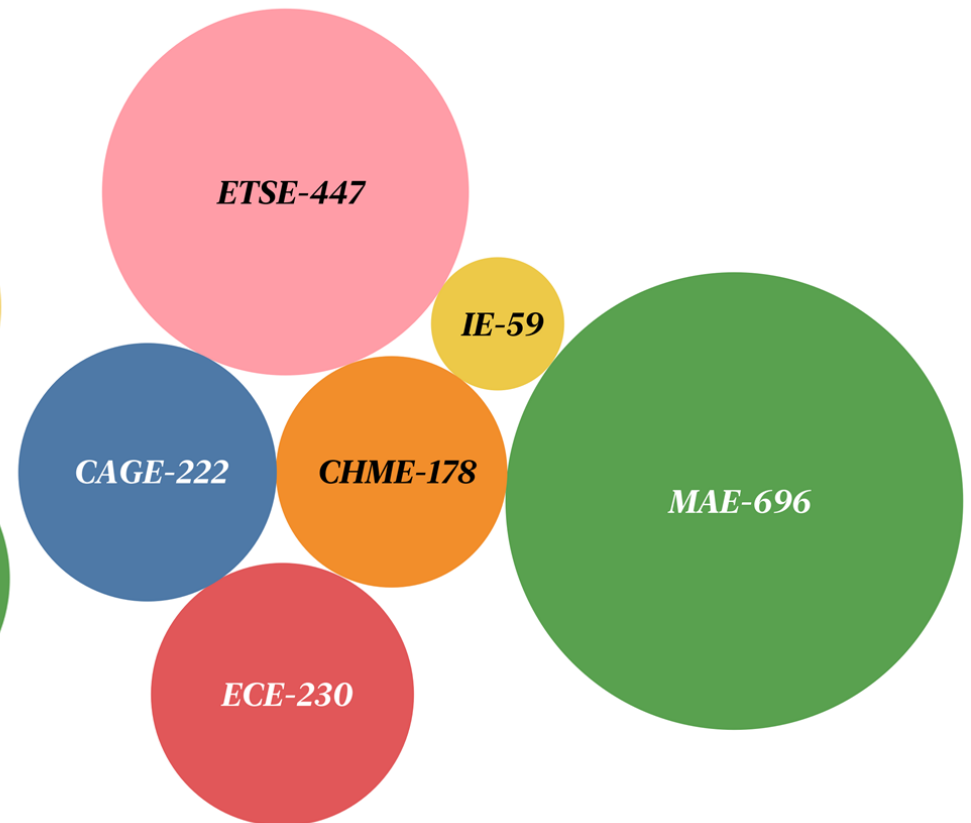
Identification of market demand

Gray's Data has allowed NMSU engineering to strategically deploy its efforts and resources on programs with high-market scores.

Market Score—Las Cruces 350-Mile Radius

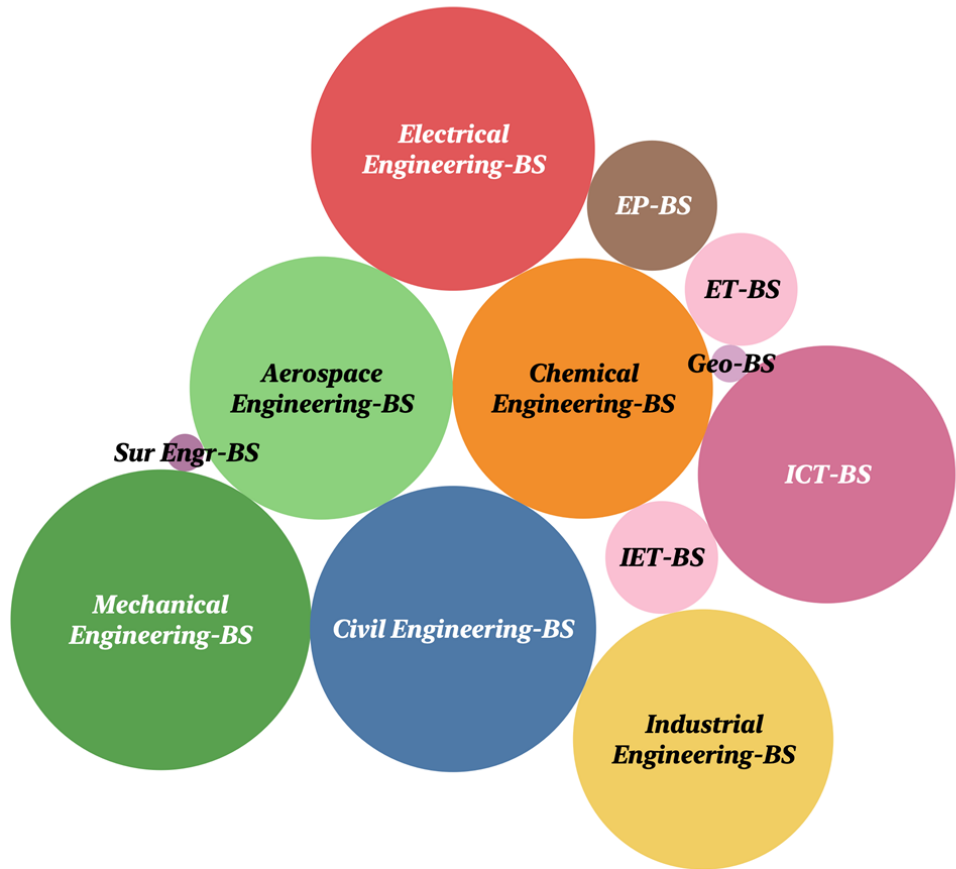


Undergraduate Enrollment—Fall 2020

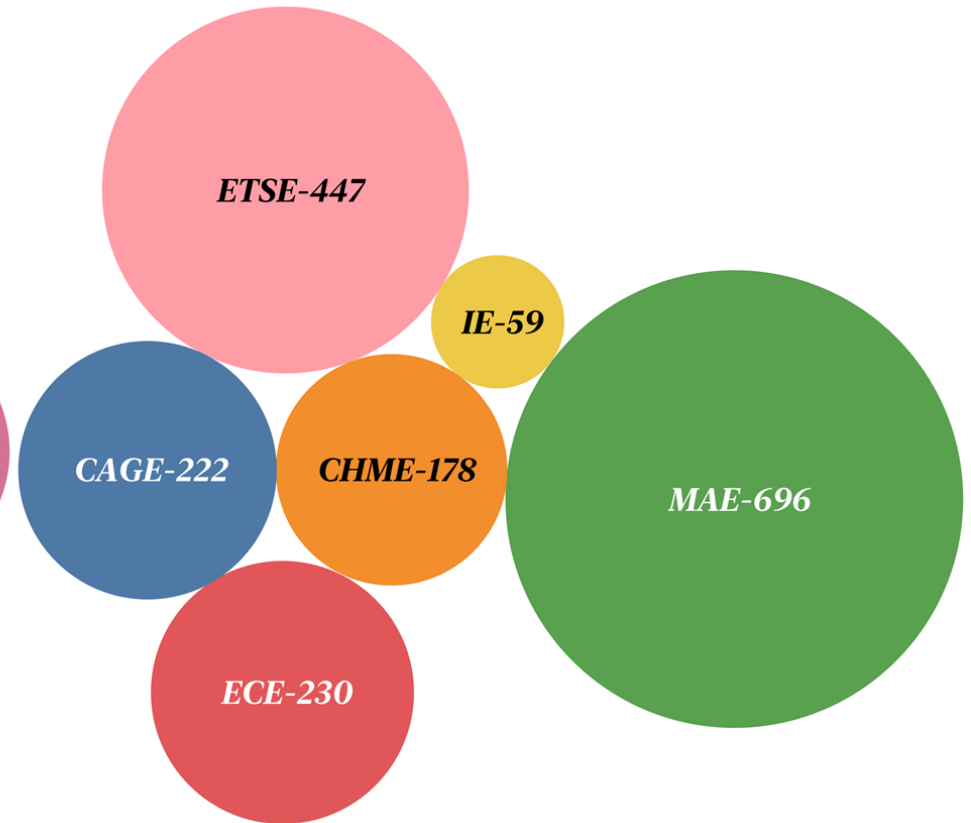


2020 COLLEGE OF ENGINEERING GOAL 1 ACCOMPLISHMENTS

Market Score—National

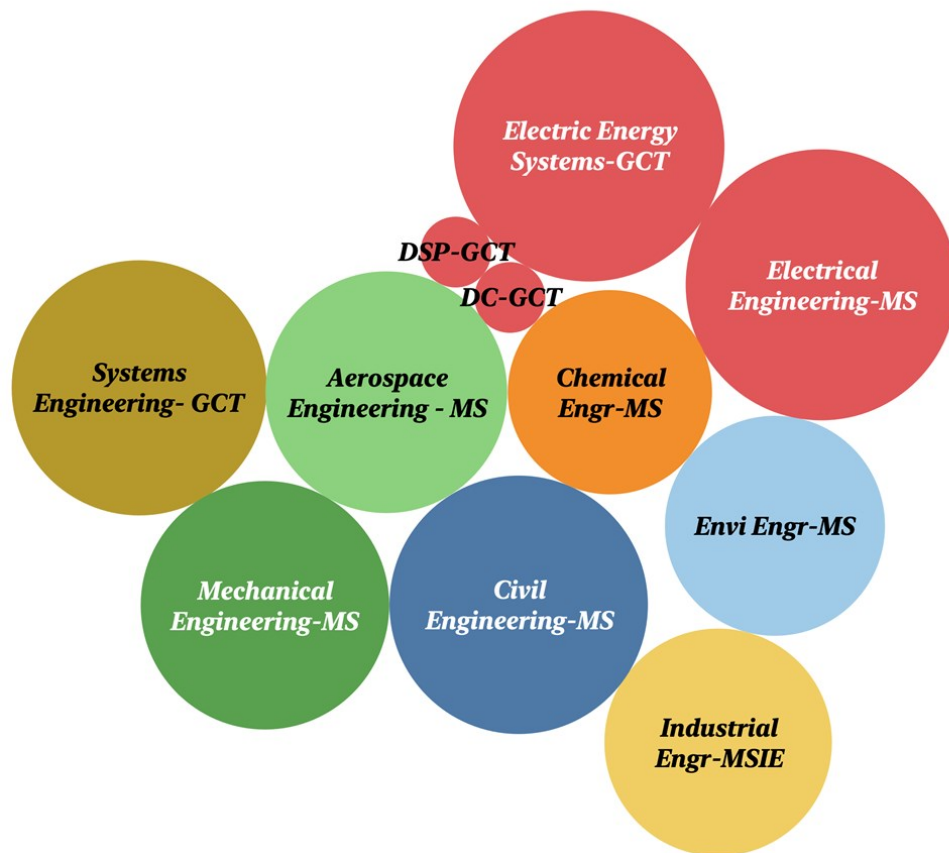


Undergraduate Enrollment—Fall 2020

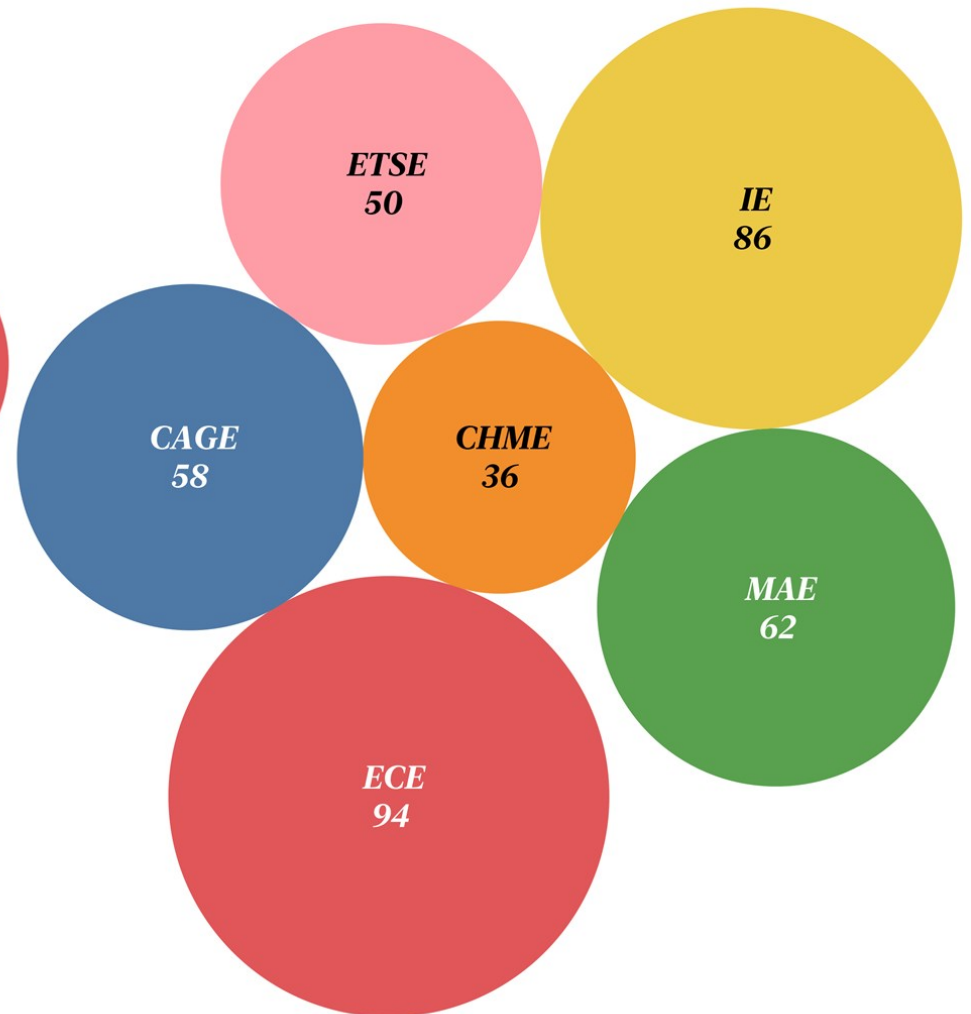


2020 COLLEGE OF ENGINEERING GOAL 1 ACCOMPLISHMENTS

Market Score—Las Cruces 350-Mile Radius

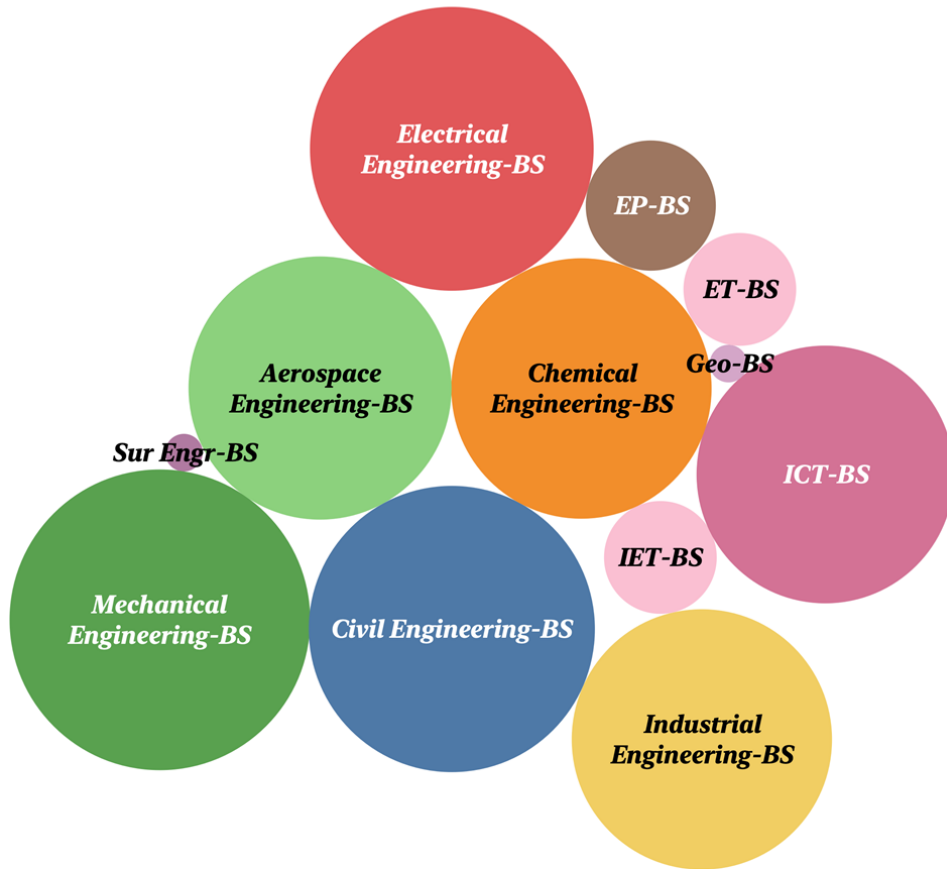


Graduate Enrollment—Fall 2020

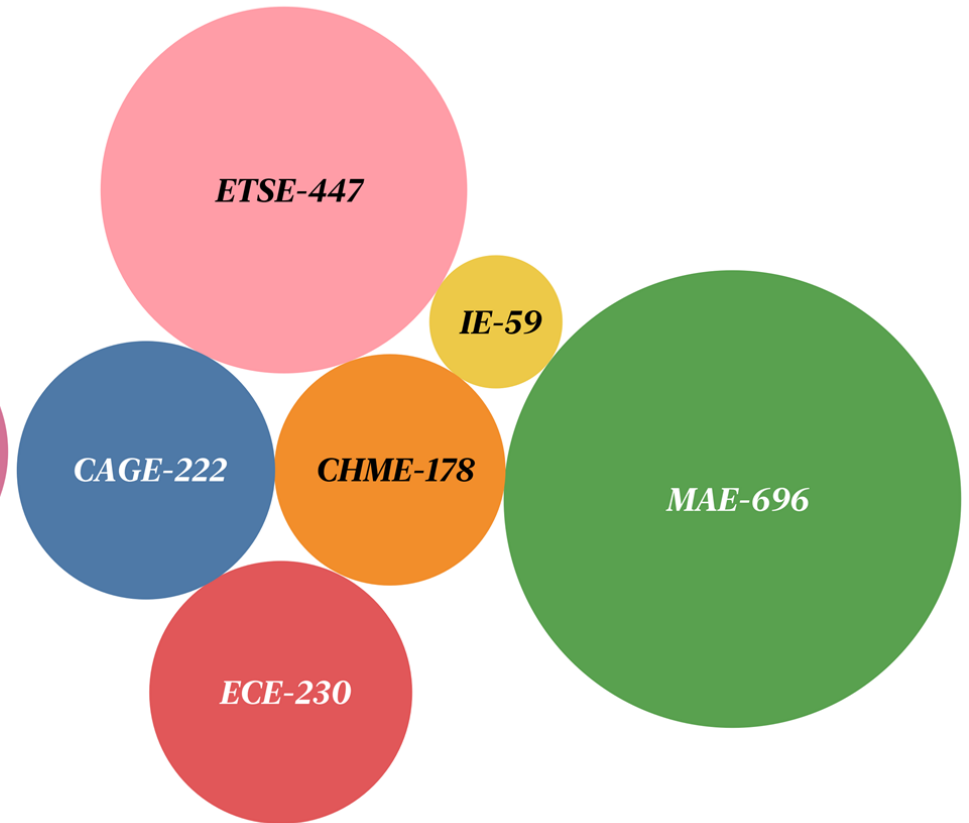


2020 COLLEGE OF ENGINEERING GOAL 1 ACCOMPLISHMENTS

Market Score—National



Graduate Enrollment—Fall 2020



COLLEGE OF ENGINEERING STRATEGIC ROADMAP

STEERING COMMITTEE

- ⇒ Nirmala Khandan
- ⇒ Steve Stochaj
- ⇒ Jay Frankel
- ⇒ Hongmei Luo



In 2020, the New Mexico Produced Water Research Consortium, a joint effort between New Mexico State University and the New Mexico Environment Department, received a research sponsorship from ExxonMobil. Pei Xu, PESCO Endowed Professor and Ward Family Endowed Interdisciplinary Chair in Civil Engineering at NMSU, leads the consortium as research director.

GOAL 2. ELEVATE RESEARCH AND CREATIVITY

Research, scholarship and creative activity provide the basis to advance excellence in teaching, learning, education, training, innovation and economic development.

Objective 2.1: Support thematic areas of research and enhance external funding.

Actions

- a. Establish thematic research areas and increase visibility of all research programs.
- b. Foster and promote research partnerships among colleges, facilitate faculty visitations to funding agencies, and invest in high-impact research ventures.
- c. Increase communication and marketing activities that promote college ranking.

Objective 2.2: Increase postdoctoral fellows, research faculty and new tenure/tenure-track startup funds for competitiveness.

Actions

- a. Increase graduate student production, with particular emphasis on the doctoral level.
- b. Increase postdoctoral and research faculty participation through partnerships with schools in the U.S. and abroad.
- c. Increase funding for graduate student stipends and diversify revenue sources.

GOAL 2. KPIS

1. Faculty average productivity will rank in the top two quartiles of our peers.
2. Each college faculty member, on an average, will have at least \$200 thousand in extramural funding per year.
3. Every tenure-track faculty member will rank in the top quartile of at least one college measure: research funding, scholarship, teaching quality and service.

COLLEGE OF ENGINEERING STRATEGIC ROADMAP



The College of Engineering continues to foster a relationship that began in 1991 with the U.S. Department of Energy Office of Environmental Management, Carlsbad Field Office. This relationship led to a renewed a grant to New Mexico State University in FY20. The project value is \$14,470,270, with a five-year project period. This internationally-recognized research facility conducts environmental and human-health monitoring for the U.S. Department of Energy's Waste Isolation Pilot Plant. It is the nation's only deep geologic repository for defense-related transuranic nuclear waste.

4. Each faculty average advising load will be two Ph.D. and three M.S. students.
5. Average archival paper submissions will be 2.5 per year per faculty member.
6. NMSU College of Engineering peer assessment score will be in the top quartile of peer institutions.
7. Ratio of postdoctoral fellows and research associates to faculty will be in top two quartiles of peer institutions.

NMSU-BASED ENGINEERING RESEARCH CENTERS

- ⇒ Carlsbad Environmental Monitoring and Research Center
- ⇒ Engineering Research Center for Re-engineering the Nation's Water Infrastructure
- ⇒ Interdisciplinary Center for Research Excellence in Design of Intelligent Technologies for Smart Grids
- ⇒ Center for Bio-mediated and Bio-inspired Geotechniques
- ⇒ Transportation Consortium of South-Central States
- ⇒ Southwest Technology Development Institute

2020 COLLEGE OF ENGINEERING GOAL 2 ACCOMPLISHMENTS

Largest FY20 Awards

- ⇒ Muhammed Dawood
Electrical and Computer Engineering
National Science Foundation
\$3.7M

- ⇒ Antonio Garcia
College of Engineering
National Science Foundation
\$2.3M

- ⇒ Igor Sevostianov
Mechanical and Aerospace Engineering
National Science Foundation
\$655K

- ⇒ Wei Tang
Electrical and Computer Engineering
National Science Foundation
\$400K

- ⇒ Punam Thakur
Carlsbad Environmental Monitoring and Research Center
Los Alamos National Security
\$346K
U.S. Department of Energy
\$3M

Increase in new research awards

The College of Engineering's new research awards during FY20 increased by 50%, which may be the largest increase in the history of the college. Total awards in FY20 included 35% from the National Science Foundation, 16% from the Department of Energy, 6% from the New Mexico Department of Transportation, 5% from Sandia National Laboratories and 5% from Los Alamos National Laboratory.

In FY20, seven junior faculty members submitted NSF CAREER proposals and three teams were pursuing NSF Engineering Research Center pre-proposals.

RESEARCH PERFORMANCE

FY20 Compared to FY19

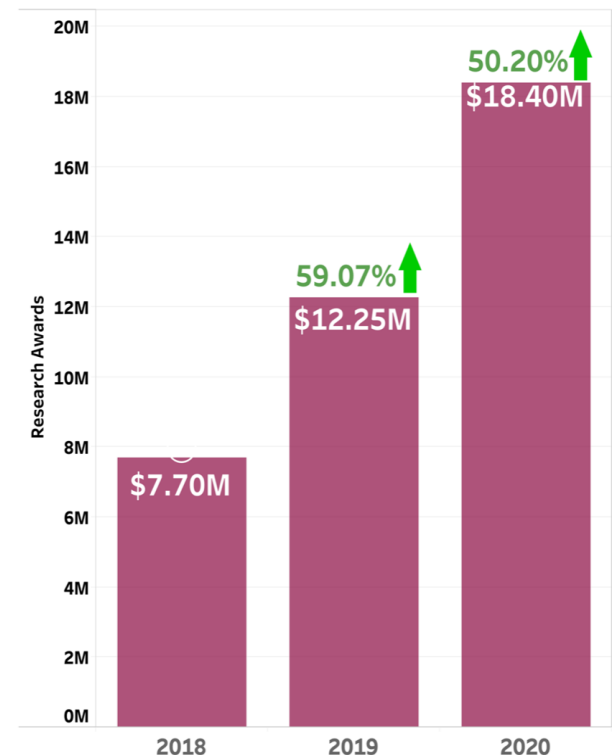
Awards: ↑ 50.2%

Expenditures: ↑ 5.8%

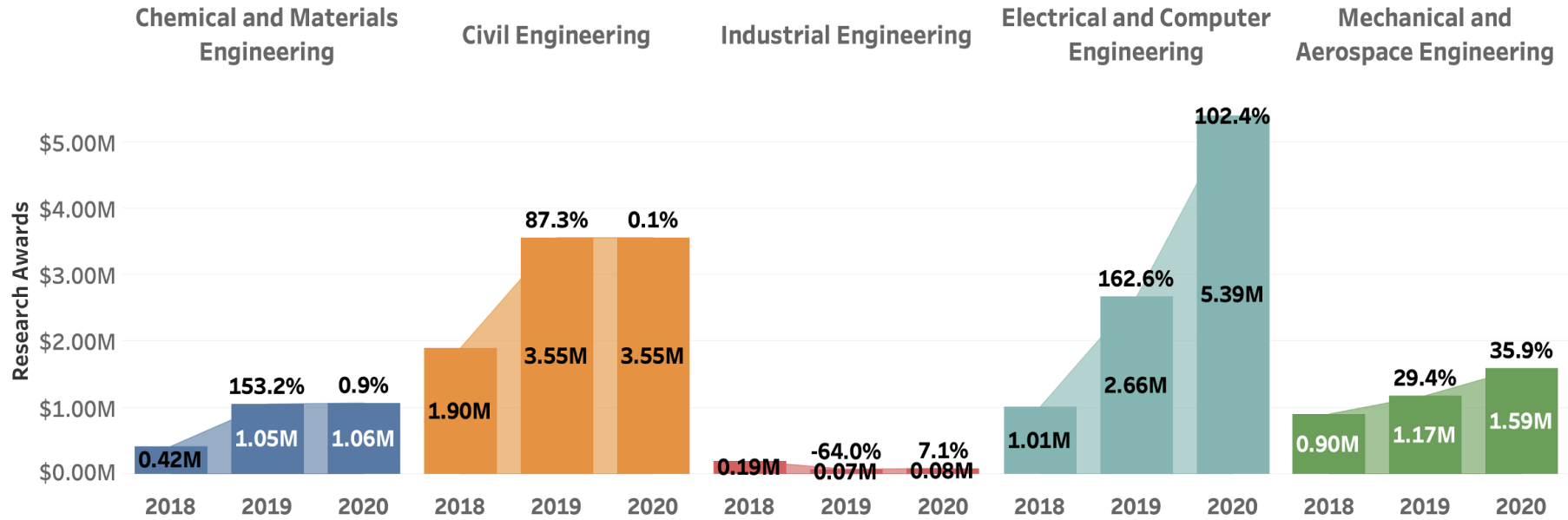
Proposal Submissions: ↑ 22.5%

Funding Requested: ↑ 18.3%

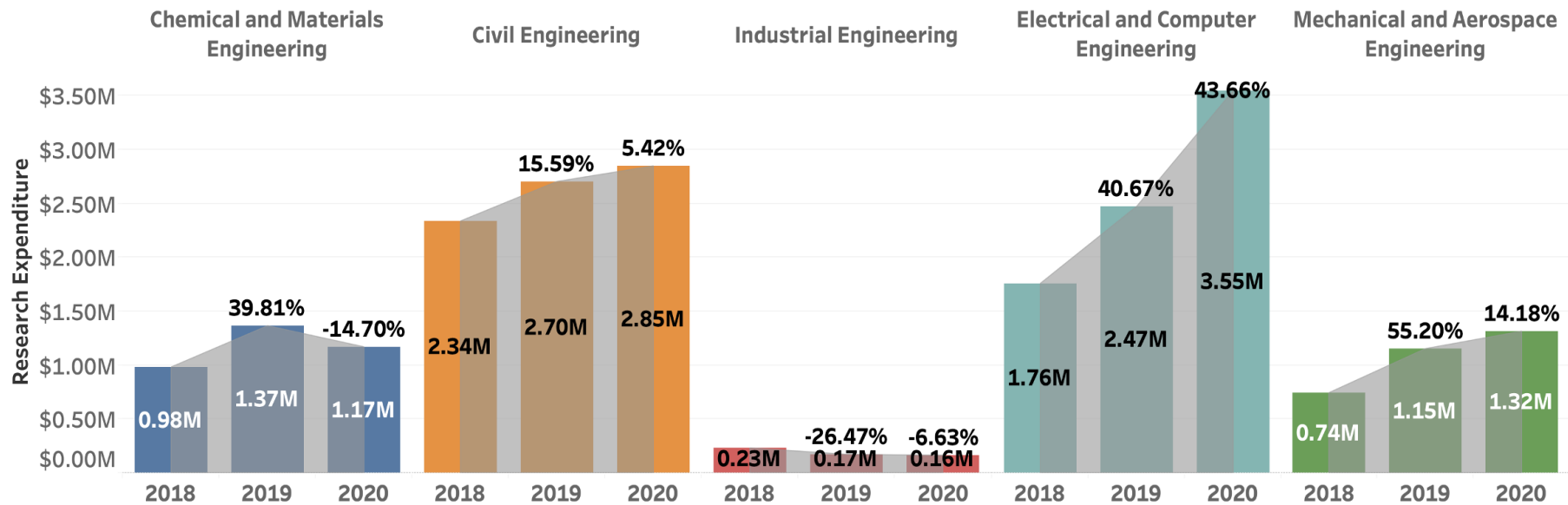
College of Engineering Research Awards



College of Engineering Research Awards by Department



Research Expenditures by Department



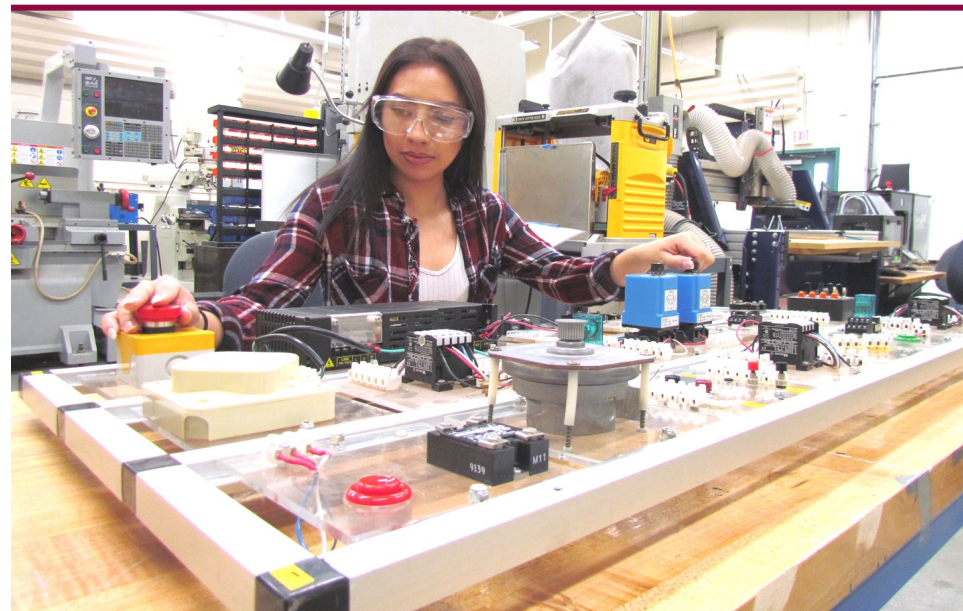
2020 COLLEGE OF ENGINEERING GOAL 2 ACCOMPLISHMENTS

Top 2% Scientists Worldwide in 2020

- ⇒ Abdessattar Abdelkefi, Associate Professor, Mechanical and Aerospace Engineering
Specialty: aerospace and aeronautics
- ⇒ Jay I. Frankel, Department Head, Mechanical and Aerospace Engineering
Specialty: mechanical engineering and transports
- ⇒ Nagamany Nirmalakhandan, Professor, Civil Engineering
Specialty: biotechnology
- ⇒ Jaime Ramirez-Angulo, Distinguished Professor, Electrical and Computer Engineering
Specialty: electrical and electronic engineering
- ⇒ Igor Sevostianov, Professor Mechanical and Aerospace Engineering
Specialty: mechanical engineering and transports

Recognition for Scholarly Activity

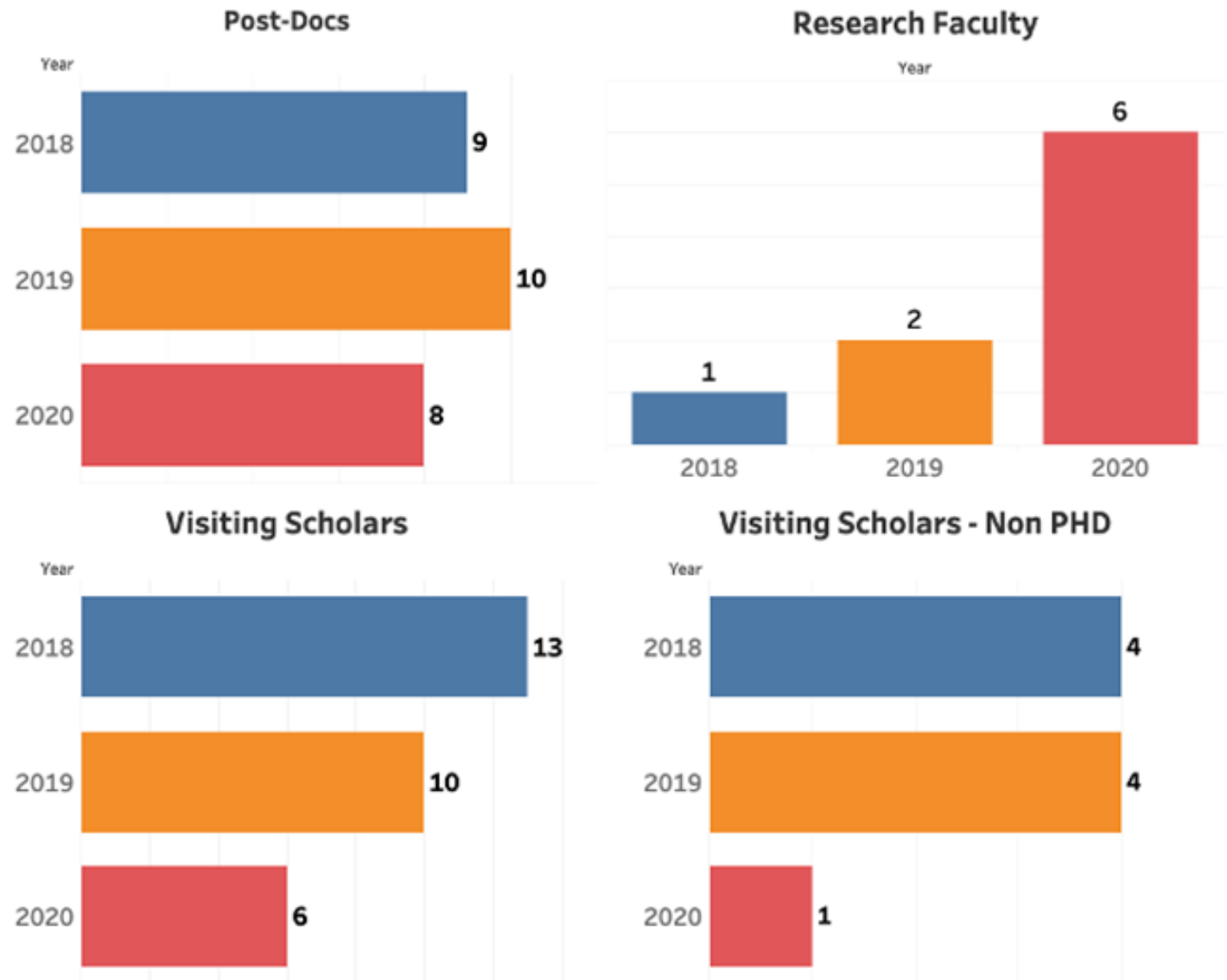
In addition to their exceptional efforts in receiving new awards, our faculty are also at the forefront of several key research areas in engineering. They are among the best of our peers in terms of research productivity. The number of publications per faculty, number of citations, and h-indices place our programs in the top quartile of our peers. A study from Stanford University published in *PLoS Biology* shows that five faculty members in our college are among the World's Top 2% of Scientists in 2020 (all fields and overall career).



Engineering received \$3.7M and Doña Ana Community College \$1.2M for "Pathways for the Successful Transfer and Retention of Engineering Students from 2-to-4 Year College in NM." Led by Engineering Professor Muhammad Dawood, the collaborative NSF project focuses on increasing the number of low-income, academically talented students who earn degrees in STEM fields. It funds scholarships up to \$10K per year and provides pathways for DACC Manufacturing and Engineering Program students who transfer to pursue NMSU engineering bachelor's degrees.

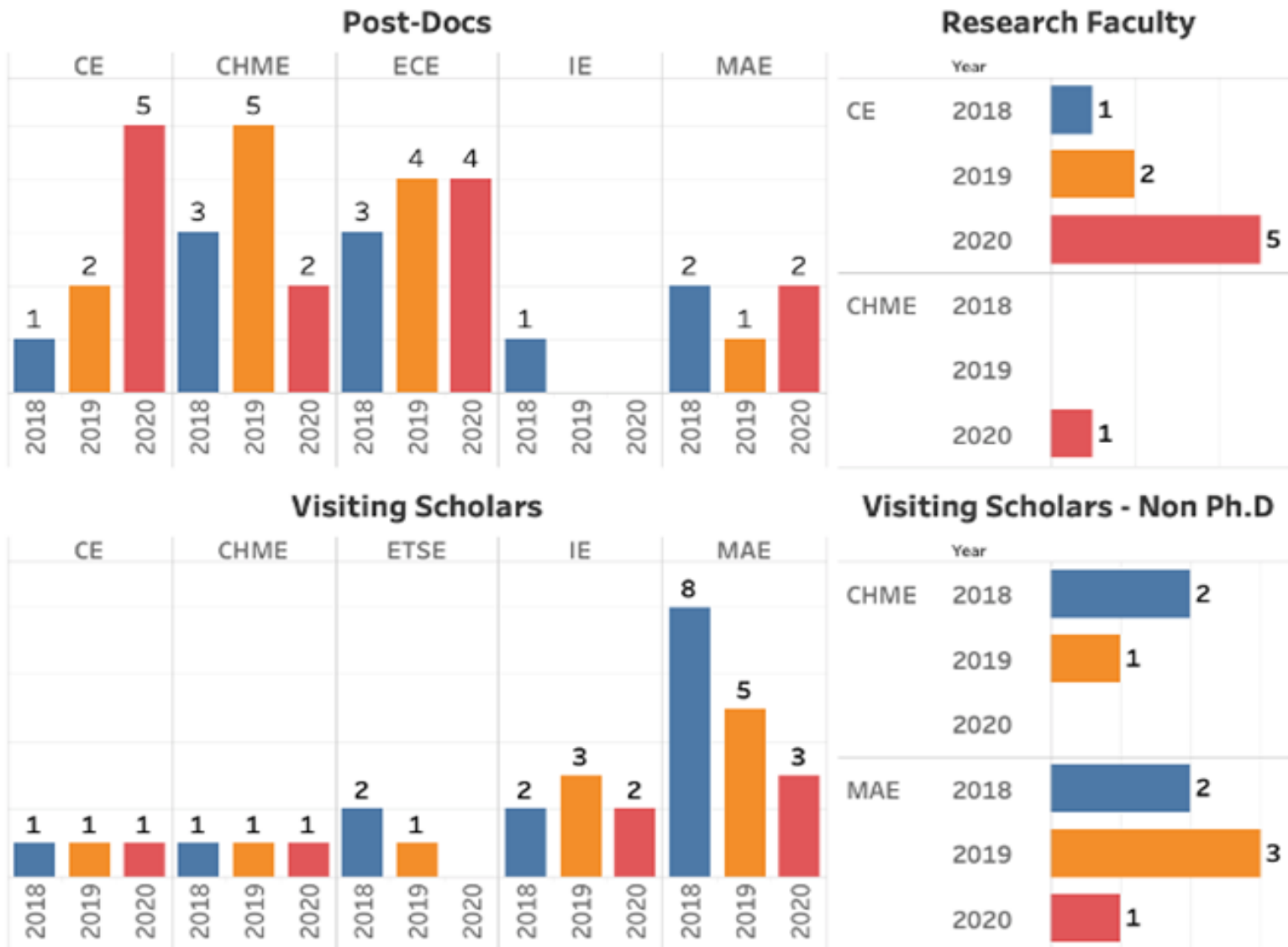
2020 COLLEGE OF ENGINEERING GOAL 2 ACCOMPLISHMENTS

Post-Docs, Research Faculty and Visiting Scholars—College-wide

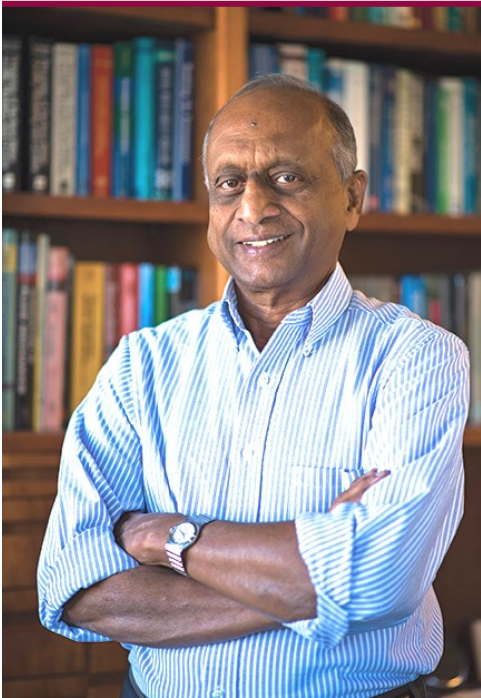


2020 COLLEGE OF ENGINEERING GOAL 2 ACCOMPLISHMENTS

Post-Docs, Research Faculty and Visiting Scholars—Department-wide



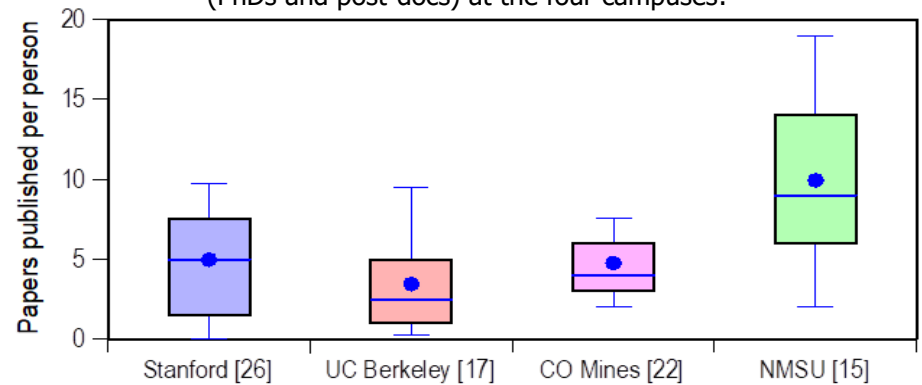
2020 COLLEGE OF ENGINEERING GOAL 2 ACCOMPLISHMENTS



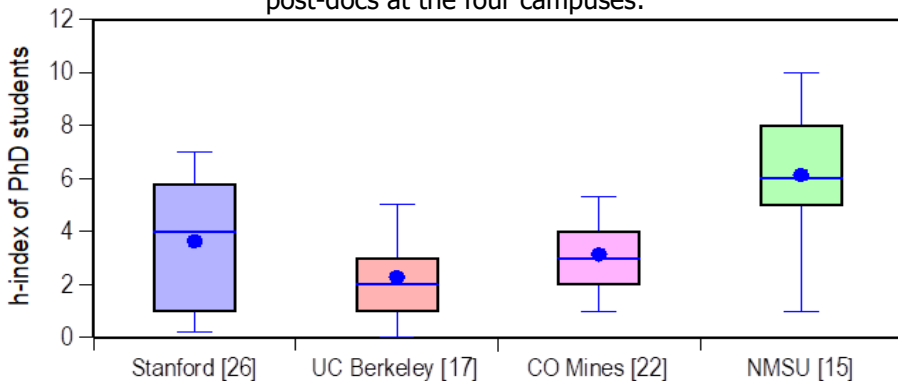
National Science Foundation Research Center yields research successes

Civil Engineering Professor Nagamany Nirmalakhandan was co-principal investigator of a multi-disciplinary team leading the National Science Foundation Engineering Research Center for Re-inventing America's Urban Water Infrastructure (ReNUWIt). Beginning in 2011, NSF funded \$36.7 million in the center over 10 years. Nirmalakhandan continues to receive funding under ReNUWIt and associated projects. The following charts indicate the performance of Ph.D.s and post-docs at ReNUWIt campuses: Stanford, UC Berkeley, CO School of Mines, and NMSU, 2011-20.

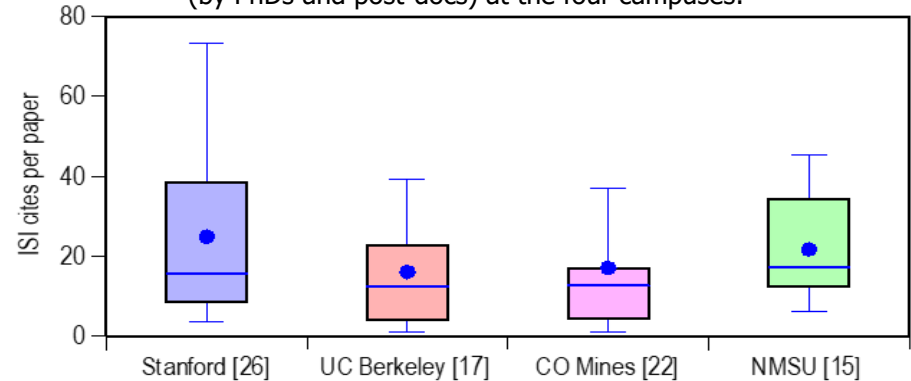
Number of papers published per person (PhDs and post-docs) at the four campuses:



Average of h-index of PhD students and post-docs at the four campuses:



ISI citations per paper published (by PhDs and post-docs) at the four campuses:



Note: [#] indicates total number of ReNUWIt PhDs and post-docs at each of the campuses.

COLLEGE OF ENGINEERING STRATEGIC ROADMAP

STEERING COMMITTEE

- ⇒ Patricia Sullivan
- ⇒ David Jáuregui
- ⇒ Delia Julieta Valles-Rosales



Showing off an egg-drop design at an engineering STEM program.

GOAL 3. AMPLIFY EXTENSION AND OUTREACH

Our outreach programs extend knowledge beyond the traditional classroom environment. We strive to provide service to alumni, engineering professionals and other groups that can benefit with the various areas of expertise that our faculty and staff members have to offer. We are also committed to engage and inspire K-12 students to develop a passion for engineering and identify the NMSU College of Engineering as the place to pursue that interest.

Objective: Increase opportunities to engage alumni, engineering professionals, K-12 students and other groups.

Actions

- Develop and diversify revenue-generating programs for the engineering workforce (Professional Development Hours).
- Develop and participate in K-12 programs to recruit new engineering students.

GOAL 3. KPIs

- Each department will develop and offer at least one revenue-generating professional development program each year.
- Every outreach activity performed in the college will be leveraged as a recruitment opportunity.

2020 COLLEGE OF ENGINEERING GOAL 3 ACCOMPLISHMENTS

K-12 STEM PROGRAMS

- ⇒ Four formal STEM outreach programs
- ⇒ 1,008 high- and middle-school student participants
- ⇒ 40 New Mexico schools
- ⇒ Many student organization and departmental-led STEM outreach activities



Since 2001, BEST Robotics has been a tradition at NMSU. An online version continued the program in 2020.

Engaging a wider community

The College of Engineering provides statewide engineering outreach services by leveraging a network of industry, community and academic partners to improve the quality of life, promote economic development and enhance educational systems in our state.

Encouraging future students

The college met the challenge of continuing long-time annual STEM outreach programs by providing them fully online. These, and STEM outreach activities led by student organizations and faculty, are geared toward helping young people develop an interest in engineering and eventually pursuing this interest at NMSU.

The 2020 PREP Academy was held for middle- and high-school students via virtual, online camps through which participants could either work through the lessons together or as a self-paced program with assistance as needed.

The college has served as the hub for the BEST competition in New Mexico and El Paso, Texas since 2001 for teams of middle- and high-school students. They receive a kit to design and build remote-controlled robots to accomplish a specific task. This year, the six-week competition through which the teams work to design and build prototypes, was held online.

2020 COLLEGE OF ENGINEERING GOAL 3 ACCOMPLISHMENTS



AIS employees and students added design and production of personal protective equipment to their workload in 2020. They supplied campus and the Las Cruces community with 2,000 plus face shields, including child-sized shields for students who require face-to-face services in public schools. They also made protective plexiglass desk shields were produced for various campus high-traffic locations and offices.

Connecting engineering students with real-world experience

The College of Engineering Aggie Innovation Space (AIS) and the Aggie Capstone Design program contribute to several of the objectives related to student engagement, experiential learning and outreach.

The AIS hosts workshops every semester on a variety of topics that are open to everyone, including NMSU students, faculty and community members. AIS personnel assist students and faculty with course projects, research and individual projects by providing expertise from product development and design to fabrication of a prototype.

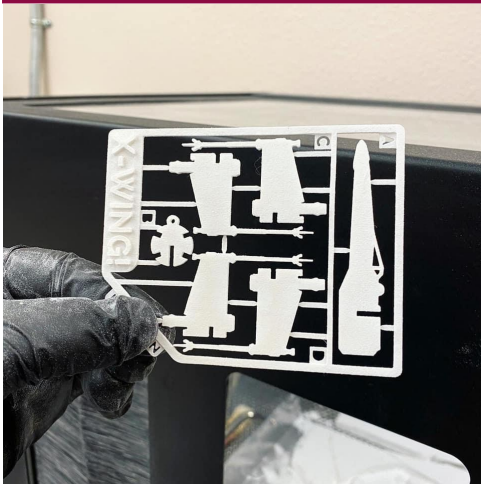
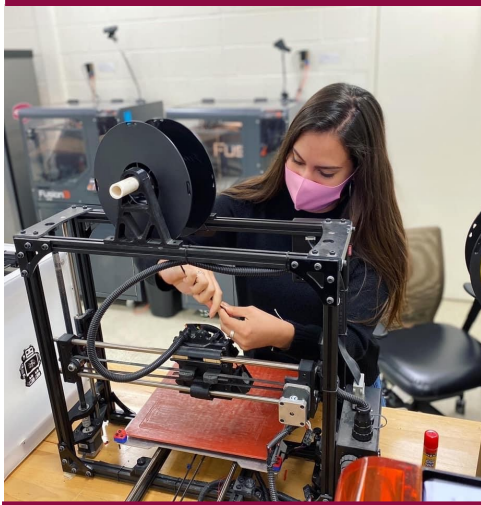
One of the college's biggest collaborations is with Arrowhead Center and their Foster Innovation Exchange program and New Mexico Small Business Assistance programs. This collaboration has allowed students, faculty and staff to work with small business startups to develop and manufacture their prototypes as well as help solve their engineering design problems. In spring 2021, AIS had 13 active projects and seven completed projects.

The Aggie Engineering Capstone Design Program, now in its third year of existence, provides students with a capstone experience attuned to real-life experience. Students work on projects defined by industry that are interdisciplinary and are overseen by professional mentors with a background in project management.

In 2020, the college implemented an entrepreneurship program, allowing engineering students the option to leverage the required capstone course sequence to develop a product idea. These students commit to following through all stages of the innovation process, from feasibility and planning through design and implementation. This creates a great learning environment where students develop their concept through a product. In spring 2021, there were two capstone projects in the engineering entrepreneurship program.

2020 COLLEGE OF ENGINEERING GOAL 3 ACCOMPLISHMENTS

Capstone Projects and Sponsors: Spring 2020-Spring 2021



Students use new 3-D printers in the Aggie Innovation Space for capstone and other projects.

Additive Manufacturing	NMSU
Chile Destemmer	NMSU
Design/Test: Serpentine Inlet JetCat Turbojet Engine	AFRL
Electrostatic Discharge Study	LANL
Luminaria Bag Folder	NMSU
Mobile HF Communication with SDR	Honeywell FM&T
Motorized Wheelchair Conversion Kit	NMSU
NASA Optical Communications	NASA
Optical Alignment System	Northrop Grumman
Permian	NightWing
Sandia Capstone Challenge	SNL
Satellite Alignment System - Docking	Northrop Grumman
Smart City - Lighting	General Dynamics Mission Systems
Smart Robot Bed	NMSU
Tooling Development: Maintenance of Trailer Chassis	Honeywell FM&T
AI-based Image Recognition	NMSU
Computer Simulation Modeling for NMSU COVID-19 Vaccine Distribution Events	NMSU
Development of Mobile Detection Device	NMSU
Eating Apparatus	NMSU
Internet of Things (IoT) Rain Gauge Device	CoCoTaHS
IoT-based Cold Chain System	NMSU
Method to Characterize Sensor Performance	General Dynamics Mission Systems
Painting Apparatus	LANL
Precision Smart Farming	NMSU
Predicting Operating States of a 3D Printer Based on Heterogeneous Sensors and Deep Learning	NMSU
Restoration of a Smart Ground Wheel Robot	NMSU
Robot Assisted Handmade Tortillas	NMSU

Note: Some of the NMSU sponsored projects are tied to funded research.

2020 COLLEGE OF ENGINEERING GOAL 3 ACCOMPLISHMENTS

ENGINEERING STUDENT CAREER DEVELOPMENT

- ⇒ Two annual career fairs
- ⇒ 107 employers
- ⇒ 1,798 student participants



In early January 2020, the college, in partnership with the NM Ready Mix Concrete and Aggregates Association, hosted a virtual version of the 57th Annual Samuel P. Maggard Quality Concrete School. The school is designed for concrete professionals, contractors, engineers and students.

Developing future engineering leaders

In fall 2019, the College of Engineering launched the Ron Seidel Engineering Leadership Institute, a two-year program with the goal of helping engineering students learn critical soft skills needed to become effective leaders and entrepreneurs who bring more than technical expertise to their profession. The institute is funded by engineering alum Ron Seidel and his wife Janice.

The first cohort comprised 10 students and in fall 2020 13 additional students were added to the group. With the goal of exposing them to various ideas and approaches to leadership, the students are reading and discussing books written by various leadership authorities.

In spring 2021, the students participated in a two-session workshop that will include discussions with successful entrepreneurs and a hands-on learning experience led by Arrowhead Center Studio G, NMSU's student business accelerator. Additionally, well-known leaders in the engineering field have led discussions with the students.

Serving the profession

Our faculty members are engaged in serving the profession in various leadership roles for a wide variety of professional societies and for the Engineering Accreditation Commission of ABET. The college also helps keep practicing engineers current through professional development offerings, workshops and seminars. Ad hoc programs presented in 2020 were Six Sigma Green Belt course, i-CREW Innovation and Commercialization for a Regional Energy Workforce, Electrify New Mexico and others.

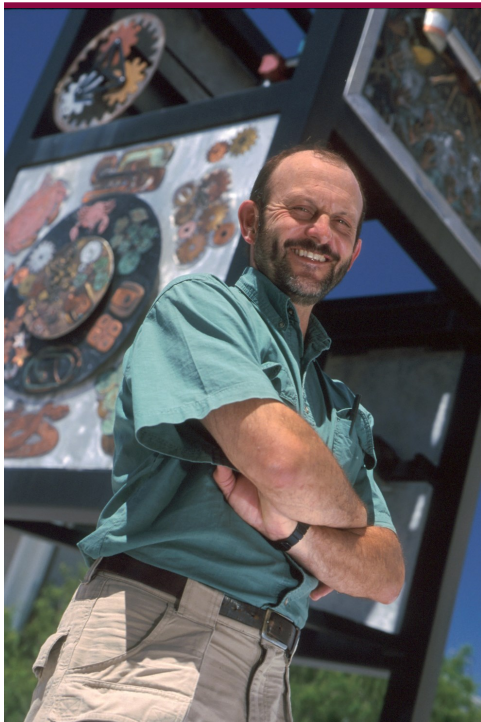
ANNUAL PROFESSIONAL DEVELOPMENT OFFERINGS

- ⇒ New Mexico Transportation and Construction Conference
 - ⇒ Quality Concrete School
- ⇒ Comprehensive Bridge Inspection Course

COLLEGE OF ENGINEERING STRATEGIC ROADMAP

STEERING COMMITTEE

- ⇒ Lakshmi Reddi
- ⇒ Linda Fresques



Engineering Technology Professor Kenny Stevens was selected by a committee of his peers to receive the 2020 Synergy One-College Faculty Award.

GOAL 4. BUILD A ROBUST COLLEGE

We seek to provide an inviting, engaging and inspiring environment for faculty, staff, students, alumni, donors, stakeholders, prospective students and their families through diversity and empowerment. We value the diverse backgrounds of students and provide an environment that supports their success.

Objective 4.1: Promote faculty and staff excellence.

Actions

- Hire top-quality faculty and staff members with searches that leverage startup funds and that impact multiple areas in the college, for example, joint appointments.
- Establish development programs such as peer mentoring, workshops, conferences, training and research symposia for faculty and staff.
- Increase faculty and staff recognition with awards, professorships, chairs and staff-ships.
- Reward productivity with travel funds, media coverage, flexible teaching loads, graduate assistant allocations, mini-grants and seed grants.
- Provide technical support for research proposal development.
- Provide avenues for faculty and staff feedback to administration.

In 2020, engineering faculty and staff members received \$12K in college awards for research, teaching, mentoring and advising. These awards are supported by private funding.

COLLEGE OF ENGINEERING STRATEGIC ROADMAP



Aggie Innovation Space Before and After

With funding received from the state and private sources over the past few years, 50's era equipment was replaced with state-of-the art machinery and is now being utilized for manufacturing pieces for capstone, research, student organization and entrepreneurial projects.

Objective 4.2 Develop and diversify gifts.

Actions

- a. Increase and diversify funding from foundations and private sources.
- b. Increase alumni engagement in college activities; establish a culture of giving back.

Objective 4.3: Advance access, diversity and internationalization.

Actions

- a. Increase representation of women and underrepresented minorities in faculty, staff and student ranks.
- b. Increase opportunities for students to transfer from New Mexico community colleges and increase partnerships with community colleges.
- c. Increase pipeline MOUs with universities in Mexico, China and India for student recruitment, faculty exchange and research opportunities.

GOAL 4. KPIs

1. Every faculty member will rank in the top quartile of at least one college measure of research, teaching or service.
2. Every department will have a mentoring program in place for both faculty and staff.
3. One hundred percent of staff members earning a performance rating of eight or above in their annual evaluation will be retained.
4. All staff members will earn a rating of at least six or above (meets expectations) on their annual performance evaluations.

COLLEGE OF ENGINEERING STRATEGIC ROADMAP



Associate Professor and Assistant Department Head Fangjun Shu, mechanical and aerospace engineering, was named D. L. and A. G. Chapman Endowed Professor in 2020.

**The college
has 24
established
endowed
chairs and
professorships
with several
more in the
works.**

5. Annual evaluation scores for all faculty members will increase every year.
6. Private funding for the college will increase by 10% each year.
7. Dollar amount of alumni gifts will increase by 15% each year.
8. Every unit in the college will participate in fundraising with giving increasing by 5% each year.
9. Every dollar raised for student scholarships will be matched with funding for other needs.
10. The percentage of female and ethnic minority faculty members and students will be in the top quartile of peer institutions.
11. The four-year graduation and retention rates for first-generation, female and ethnic minority students will be the same as that of majority segments of the engineering student population.
12. Each department will have a curricular collaboration or student pipeline with at least one community college in the state.
13. The college will have collaborative agreements and active student pipelines with at least six universities in Mexico, China and/or India.

2020 COLLEGE OF ENGINEERING GOAL 4 ACCOMPLISHMENTS



Special Executive Administrative Assistant Donato Lozano was awarded the Synergy One-College Staff Award in 2020.

Recognizing faculty and staff excellence

As a means to support and reward excellence to College of Engineering faculty and staff members awards are conferred on an annual basis. The awards are administered by the College of Engineering Faculty and Staff Awards Committee, with final approval given by the dean. Awardees are recognized at a ceremony held during Engineers' Week. Eleven \$1,000 awards are given.

ANNUAL ENGINEERING AWARDS

- ⇒ Teaching-Research-Service Synergy (faculty)
- ⇒ Leadership Synergy (faculty and staff)
- ⇒ One-College Synergy (faculty and staff)
- ⇒ College of Engineering Mentorship (faculty or staff)
- ⇒ Ed Foreman Excellence Awards (faculty and staff)
- ⇒ Bromilow Outstanding Staff Service
- ⇒ Bromilow Faculty Excellence (alternates annually between teaching and research)

2020 COLLEGE OF ENGINEERING GOAL 4 ACCOMPLISHMENTS

CAPITAL CAMPAIGN FOR THOMAS AND BROWN HALL REPLACEMENT

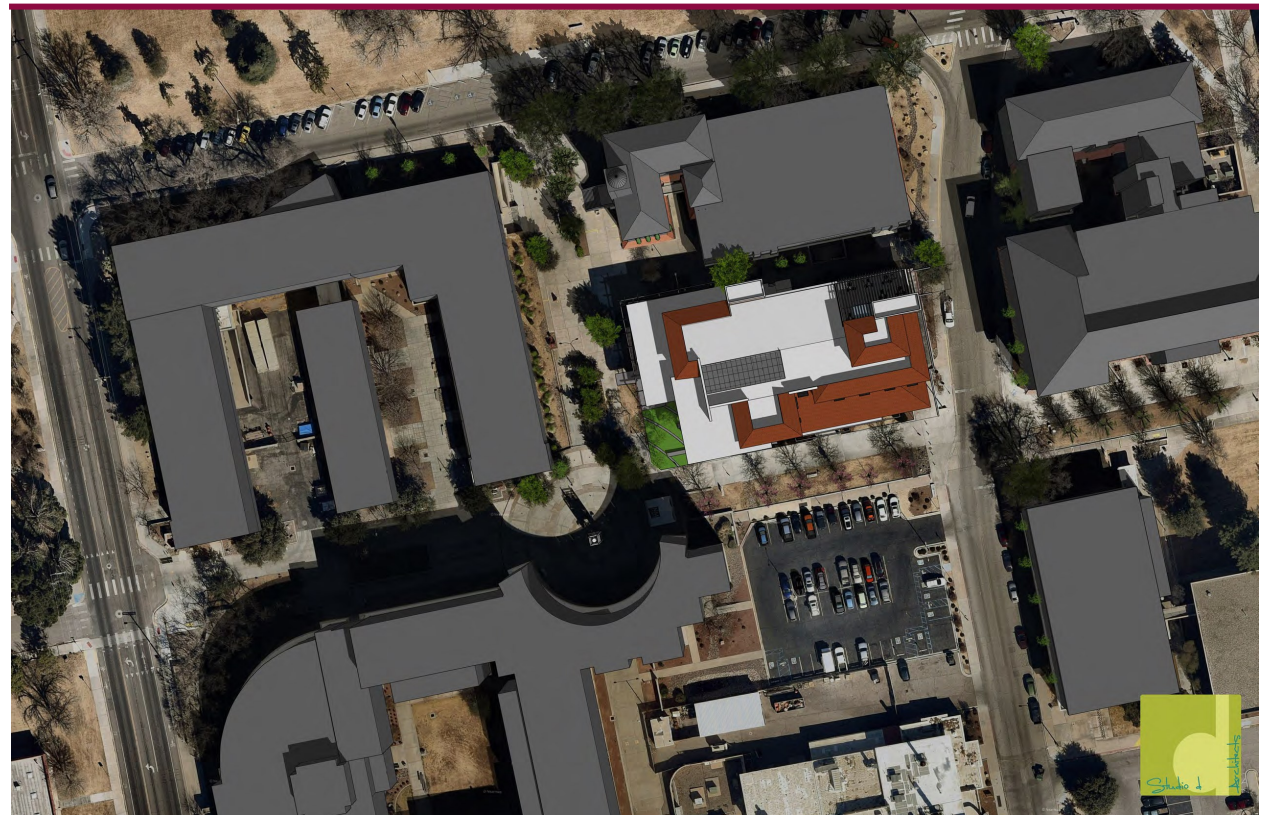
- ⇒ General Obligation Bond: \$20M
- ⇒ Collaborative Learning Spaces and Classroom Revisions: \$5M
- ⇒ Private Gifts: \$5 million



Thomas and Brown Hall was dedicated in 1971 in honor of Melvin A. Thomas, former dean, and Harold "Prof" Brown, former electrical engineering department head. The building became home to the electrical engineering department, today known as the Klipsch School of Electrical and Computer Engineering.

Reimagining engineering facilities

The opportunity for replacing the nearly 50-year-old Thomas and Brown Hall opens up possibilities to reconfigure the College of Engineering complex and welcome changes that will nurture cross-disciplinary, collaborative, and distance learning to promote student success. The groundwork for this exciting project started in 2020.



2020 COLLEGE OF ENGINEERING GOAL 4 ACCOMPLISHMENTS

Artistic Rendering of Thomas and Brown Hall Replacement



2020 COLLEGE OF ENGINEERING GOAL 4 ACCOMPLISHMENTS

A GLIMPSE OF THE FUTURE

- ⇒ Break down silos to enhance student success and research opportunities.
- ⇒ Build on student-centric and experiential learning focus of engineering
- ⇒ Increase efficiencies and lower costs
- ⇒ Embrace the new digital college experience
- ⇒ Capitalize opportunities to make changes across the engineering complex
- ⇒ Make active learning program space more visible and extend availability
- ⇒ Assess space usage: fewer classrooms, more laboratories for research, capstone projects and student organization competitions
- ⇒ House cross-disciplinary researchers together rather than by department

Fewer classrooms, more laboratories

The plan will make active learning program space more visible and extend availability campus-wide for experiential learning opportunities. There will be fewer classrooms and more laboratories for research, capstone projects and student organization competitions. Cross-disciplinary researchers will have space to work together rather than in separate departments. Virtual communication technology will be incorporated to improve and grow online learning experiences.



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College of Engineering

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