

College of Engineering

2022

ANNUAL PROGRESS REPORT



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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



New Mexico State University Klipsch School of Electrical and Computer Engineering Assistant Professor Luis Rodolfo Garcia Carrillo is using neuromorphic computing research to advance the future of autonomous systems such as drones, satellites and robots.

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



Luke Sanchez, a biology major and student regent at New Mexico State University, is using flies to study degeneration in eyes with the help of student engineers from the Aggie Innovation Space. Sanchez uses high-powered microscopes to look at fly eye samples.

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

- a. Identify programs that fulfill regional workforce needs, and match teaching and research interests and expertise of faculty members.
- b. Increase online presence and expand delivery modes of degree/certificate/training programs.
- c. Foster exposure to entrepreneurship through collaborative activities with Arrowhead Center.
- d. 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

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

COLLEGE OF ENGINEERING STRATEGIC ROADMAP



Spring Alumni Association
Engineering Outstanding Senior
and Engineering Physics
Department Outstanding Senior
Domunick Gonzales held summer
internships with NASA White Sands
Test Facility in 2021 and 2022. He
is now a permanent employee at
White Sands.

- 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.

2022 COLLEGE OF ENGINEERING GOAL 1 ACCOMPLISHMENTS



NMSU engineering students show off the new art station that was created specifically for Sam Cueto who is quadriplegic. The uniquely designed art station makes it easier for him to engage in his creative past-time. It was a capstone project and more.

“I was very anxious and wanted it to be perfect for Sam and for it to be everything that he wanted it to be,” said Sami Naser, lead engineer on the project.

Increase in undergraduate apply-enroll yield

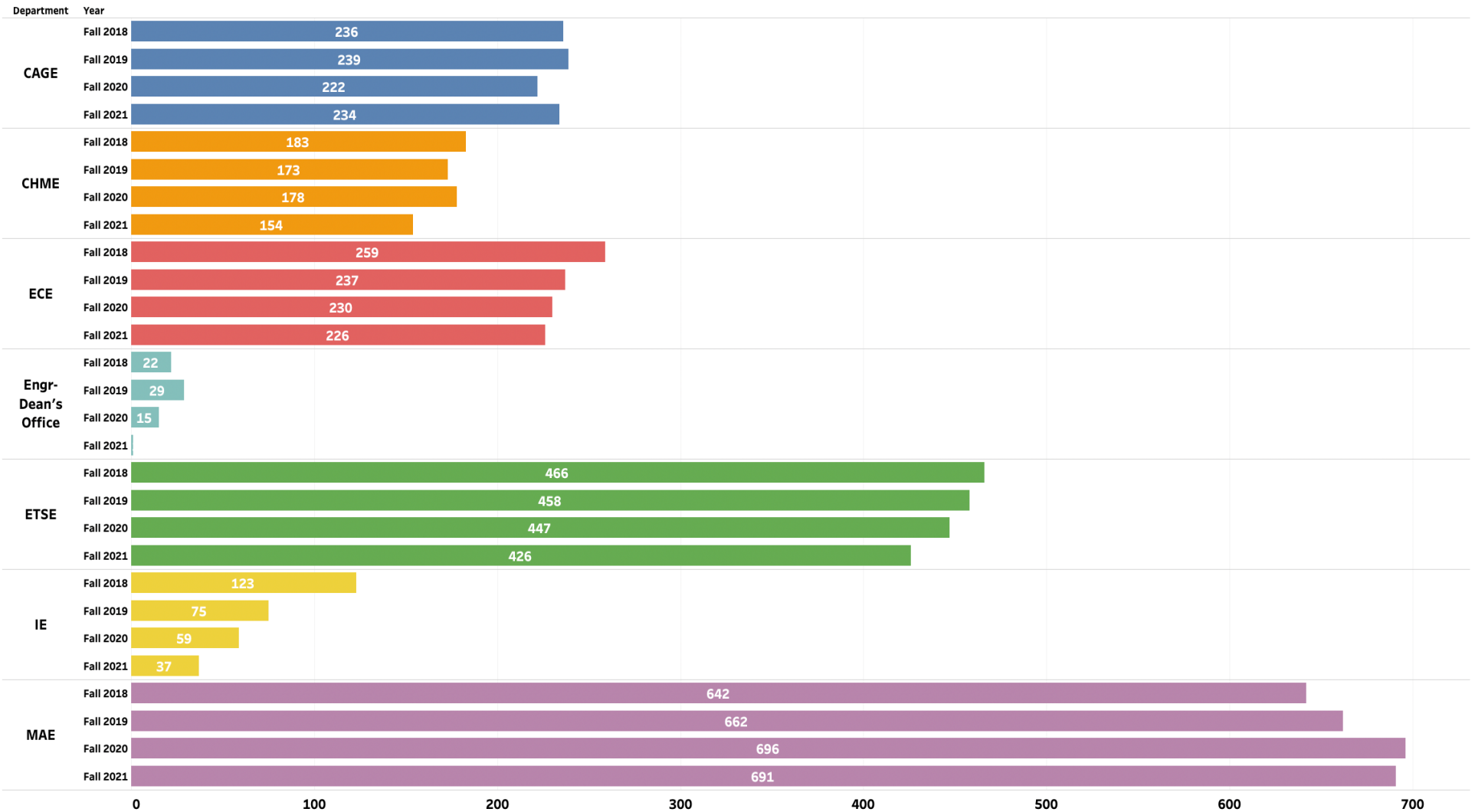
Increased interest in undergraduate degree programs is reflected in the yield or percent of new students who enroll after applying. In 2021, we saw an increase in yield to 24.2% from the 2020 level of 22.6%. However, the first full academic year of the COVID pandemic created a 4% decrease in freshmen enrollment. Total enrollment in the College of Engineering was down slightly from 2,207 students in fall 2020 to 2,121 students in fall 2021.



More than 1,770 students visited the Eloy Torrez Family Engineering Learning Communities for assistance during the '20-'21 academic year.

2022 COLLEGE OF ENGINEERING GOAL 1 ACCOMPLISHMENTS

Department Enrollment—Undergraduate



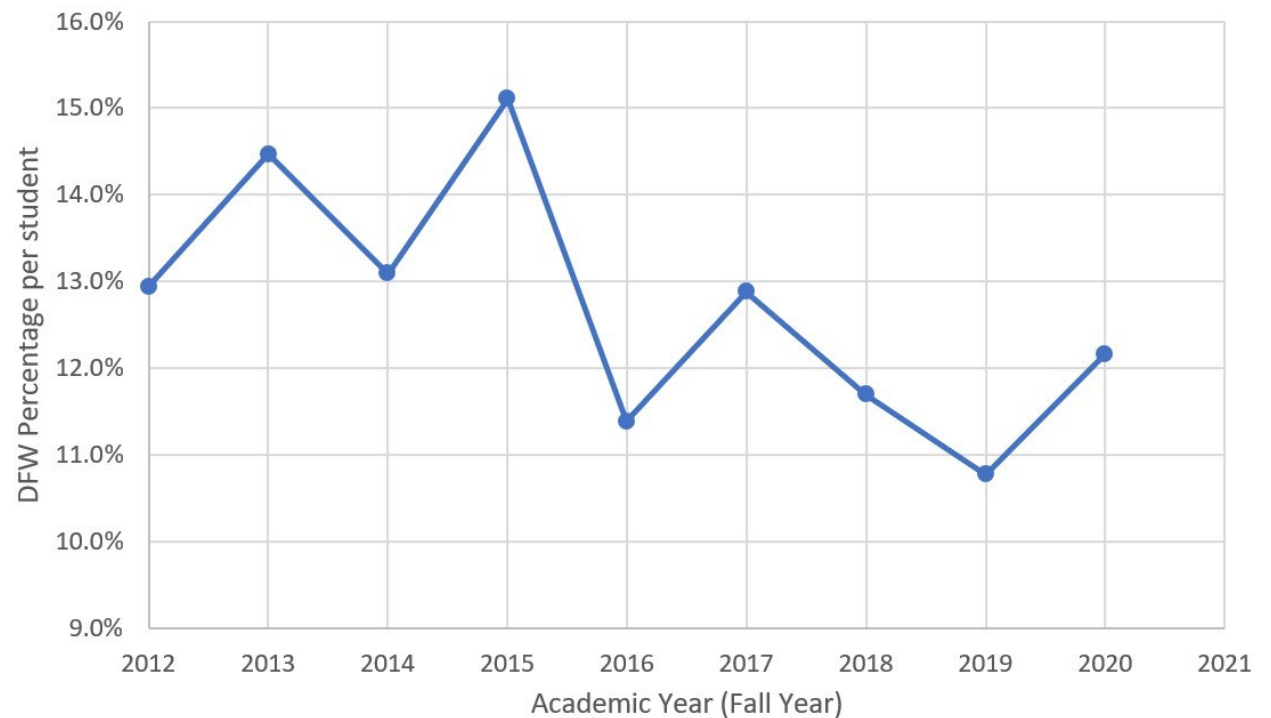
2022 COLLEGE OF ENGINEERING GOAL 1 ACCOMPLISHMENTS



Student involvement is key to student success. The NMSU Atomic Aggies won the coveted 2022 Chile Cup at the Spaceport America Cup Intercollegiate Rocket competition. The Chile Cup is a faceoff amongst local rivals NMSU, New Mexico Tech, the University of Texas at El Paso and the University of New Mexico.

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. For 400-level engineering classes, the college has maintained well below that level even with the ongoing COVID pandemic. The graph below for the academic year 2020 shows a slight increase in overall D, W and F grades, but the percentage was lower than 2015 and prior years due to improvements in student success rates for 300-level engineering courses.



2022 COLLEGE OF ENGINEERING GOAL 1 ACCOMPLISHMENTS



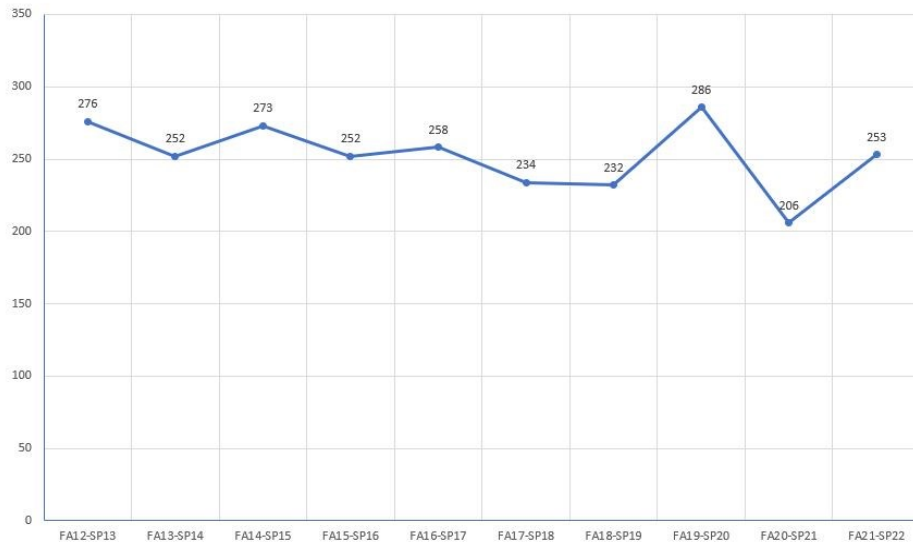
Hyeonjun Park, MAE, and Steven Stochaj, ECE are leading a team of students on a project to develop methods to help CubeSats with autonomous docking.

Curricular assessment to support student success

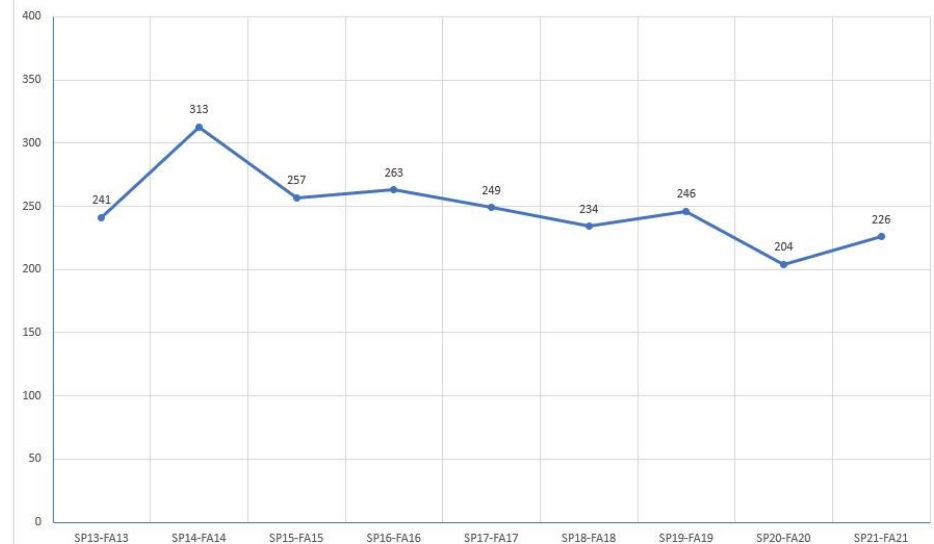
The College of Engineering studied and analyzed data to better understand student retention. First, student enrollments were tracked from fall to spring and spring to fall for the past seven semesters.

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.

COE Students Lost - Fall to Spring



COE Students Lost - Spring to Fall



2022 COLLEGE OF ENGINEERING GOAL 1 ACCOMPLISHMENTS

The bachelor's degree program in geomatics/surveying received its second \$25K Engineering Education grand prize from the National Council of Examiners for Engineering and Surveying. It is the fourth award the program has received from the organization.



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

2022 COLLEGE OF ENGINEERING GOAL 1 ACCOMPLISHMENTS

ENGINEERING EDUCATION RESEARCH AWARDS

Olga Lavrova, ECE: "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, ECE: "NMSU Educational Partnership with NASA/GSFC and WSC;" NASA/Johnson Space Center/White Sands Test Facility; \$118K

NM 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, ECE: "Two-to-Four-Year Pathway for Successful Transfer and Retention of Engineering Students;" National Science Foundation; \$3.8M

Solving the Math Problem

Mathematics courses remain the most difficult for engineering students out of the top six most difficult courses. MATH 191 and 192, and calculus 1 and 2 are prerequisites for engineering courses in almost every program. When students have difficulty completing these courses they are forced to take courses outside the engineering curriculum to maintain full-time enrollment. Student become frustrated not being able to progress in their degree program and eventually leave the college. To address this problem, the following initiative was undertaken:

Teach Engineering Mathematics, ENGR 190 starting fall 2021. This course replaced Math 191 and 192 as prerequisites for engineering courses. This allows students to advance in the curriculum, become better prepared for the calculus courses, and provides more time to complete the calculus courses requirements.

The overall DFW rate for ENGR 190 is 17% and for Calculus 1 and 2 the corresponding rate is 24%. The DFW rates for statics and dynamics is 11% and 14% respectively. With more effort put into tutoring for ENGR 190 it is believed that the DFW rate can be reduced. It is believed that the DFW rate for the calculus sequence will also decline as students will also be better prepared for these courses. The ENGR 190 course is also taught by the same highly qualified instructor every semester. It is believed that this also contributes to the success of the students in the course. This is not the case for the calculus sequence.

2022 COLLEGE OF ENGINEERING GOAL 1 ACCOMPLISHMENTS



Alma Carolina Escobosa, Ph.D. candidate, chemical engineering, received the Frontera Computational Science Fellowship. The fellowship program provides a year-long opportunity for talented graduate students to compute on the most powerful academic supercomputer in the world and collaborate with experts at the Texas Advanced Computing Center. She will receive a \$34,000 stipend, up to \$12,000 in tuition allowance throughout the year.

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.

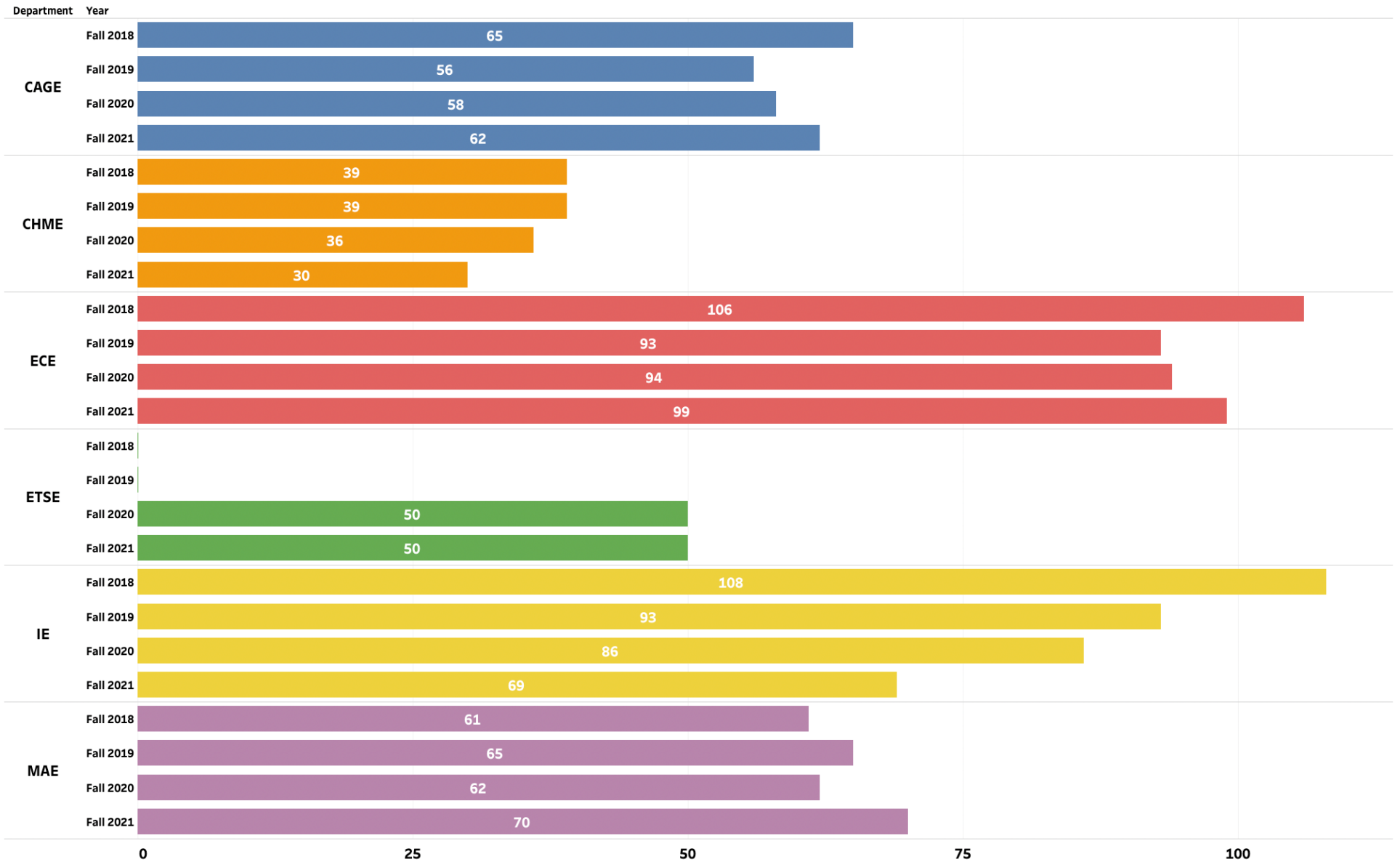
NMSU's online masters' programs in engineering were ranked on the U.S. News & World Report's Best Online Education Programs list offered by U.S. National Universities.



Giovanni Rascon, NMSU alumnus and network engineer at ANM, sits at his at-home workstation. Because of the flexibility of NMSU-O's MIT program, Rascon completed his professional masters' in one year.

2022 COLLEGE OF ENGINEERING GOAL 1 ACCOMPLISHMENTS

Department Enrollment—Graduate

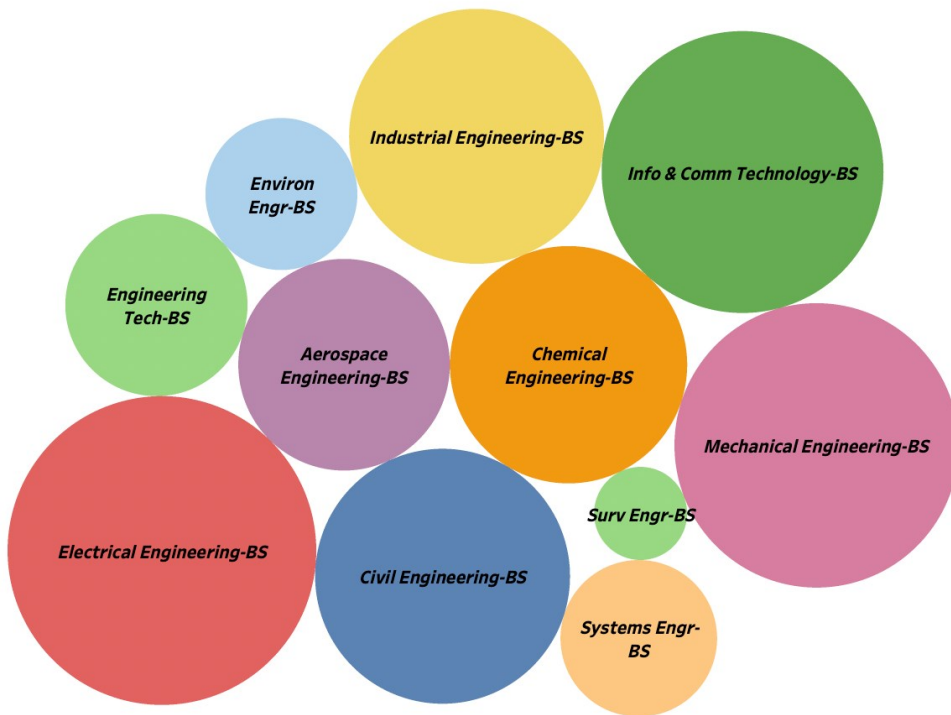


2022 COLLEGE OF ENGINEERING GOAL 1 ACCOMPLISHMENTS

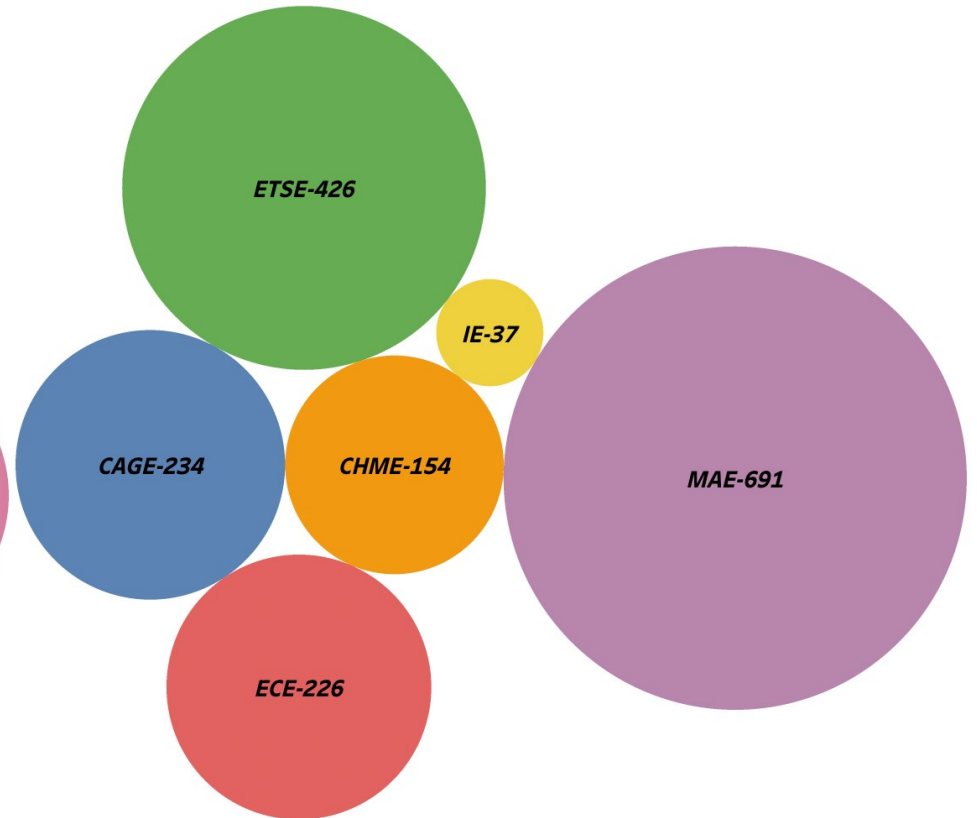
Identification of market demand

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 2021

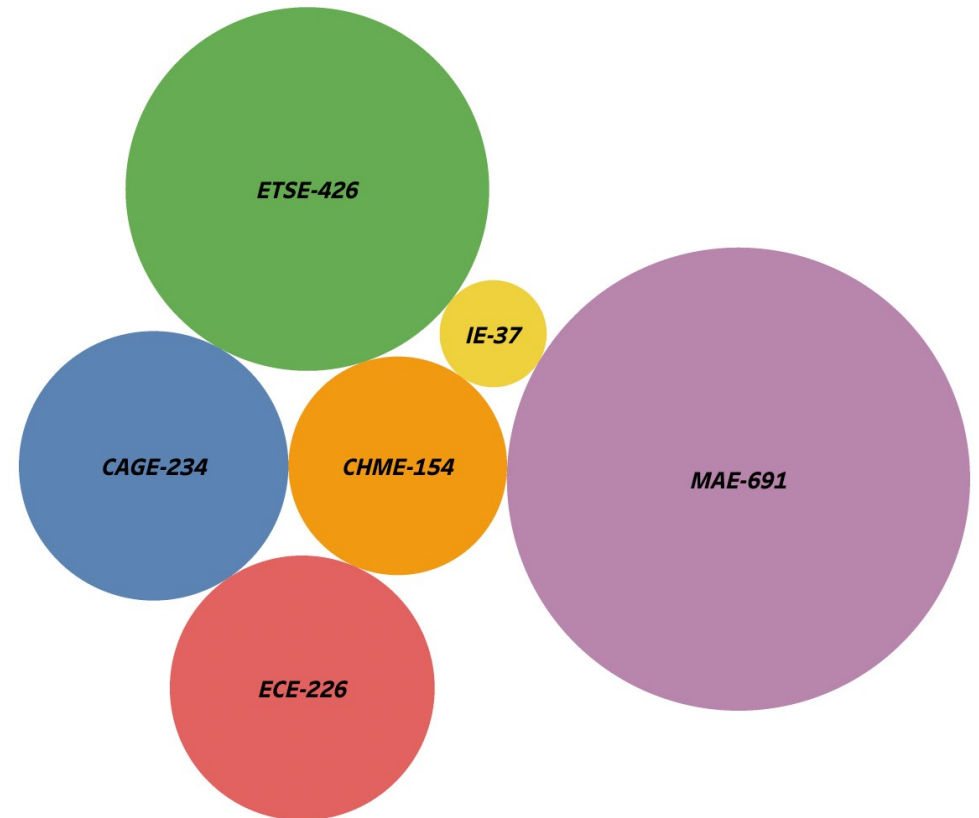


2022 COLLEGE OF ENGINEERING GOAL 1 ACCOMPLISHMENTS

Market Score—National

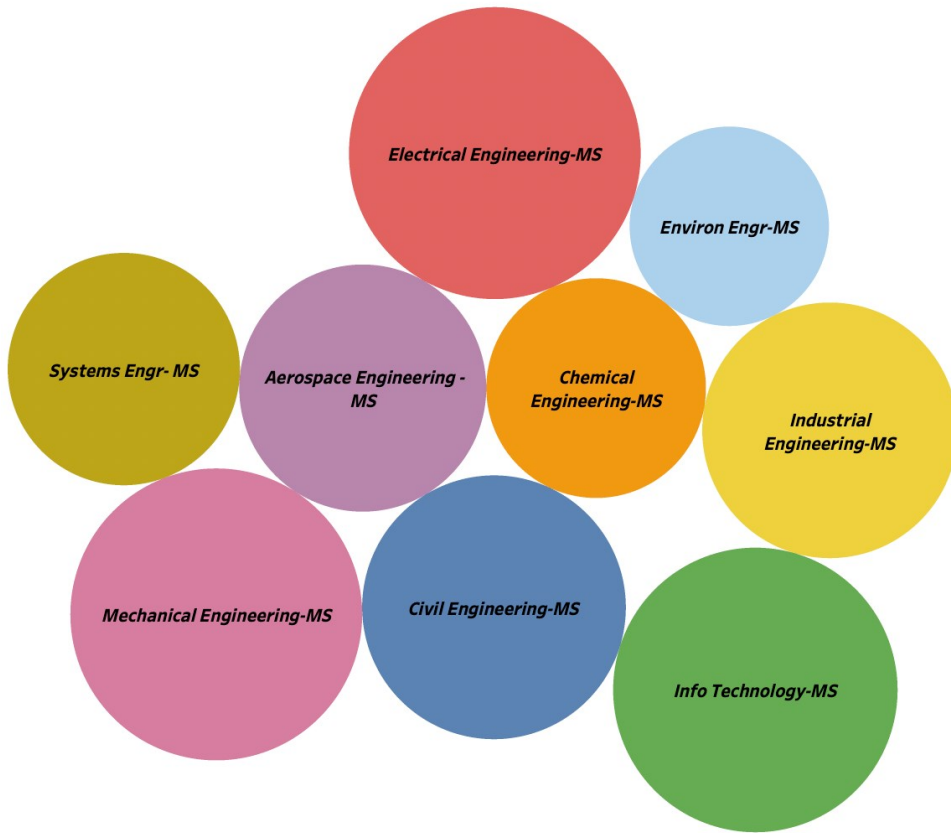


Undergraduate Enrollment—Fall 2021

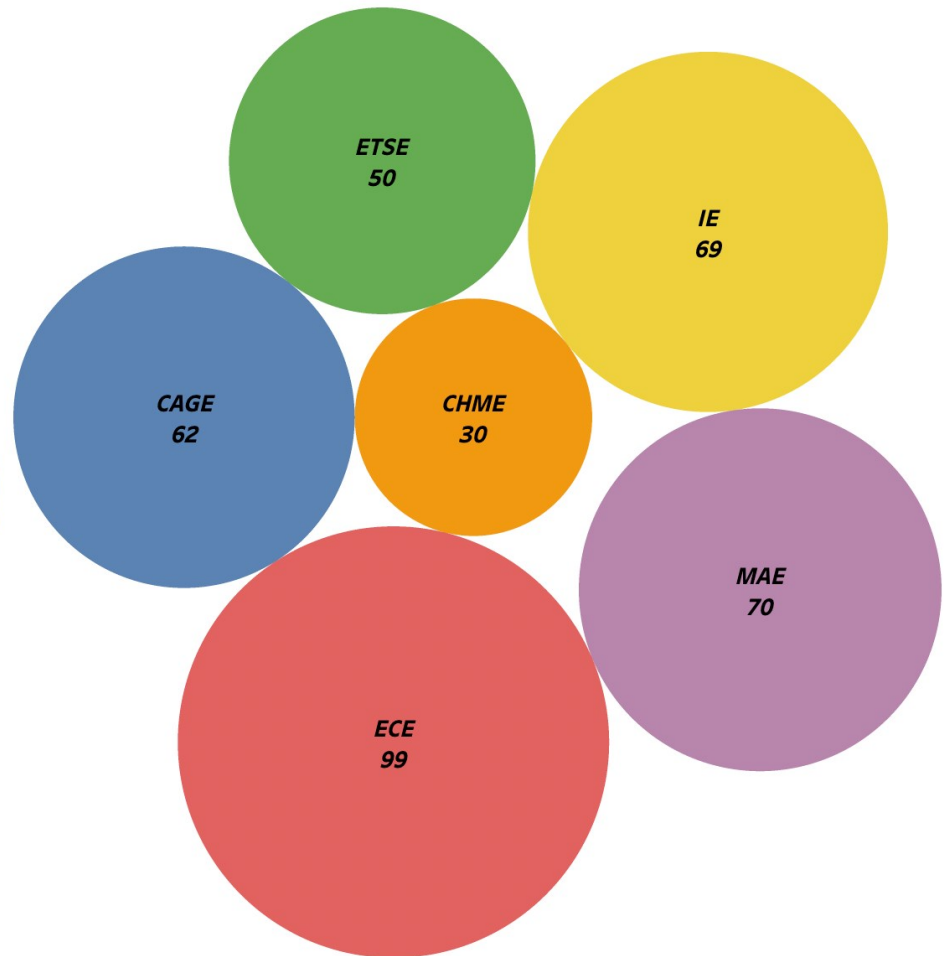


2022 COLLEGE OF ENGINEERING GOAL 1 ACCOMPLISHMENTS

Market Score—Las Cruces 350-Mile Radius

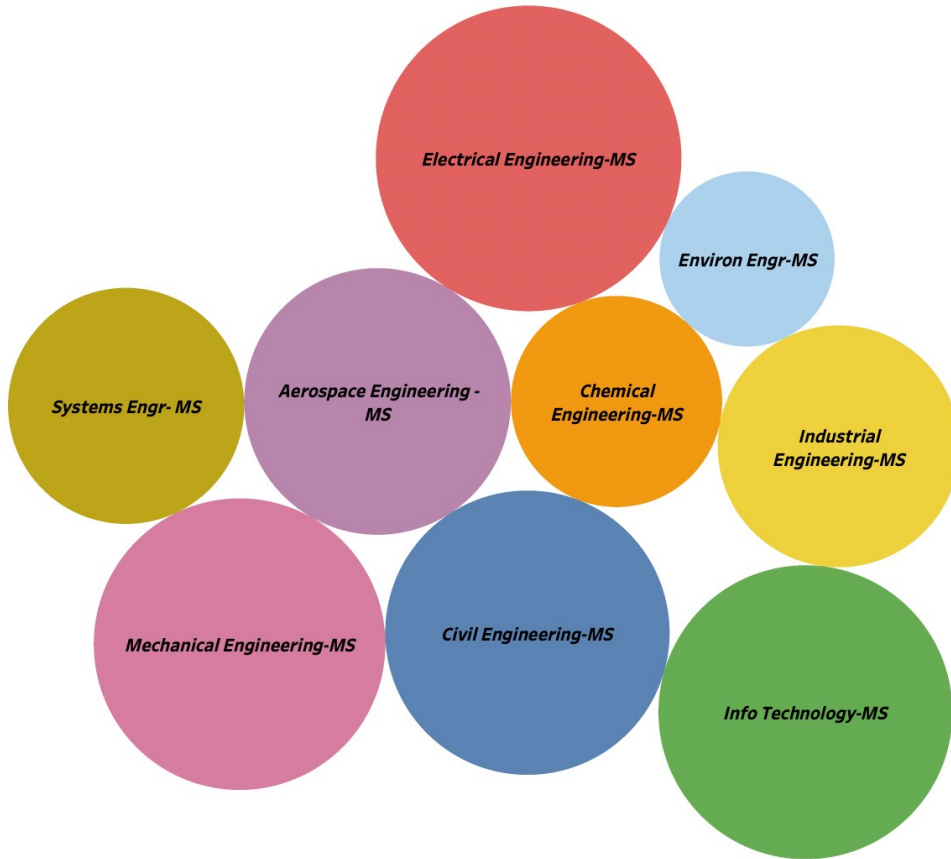


Graduate Enrollment—Fall 2020

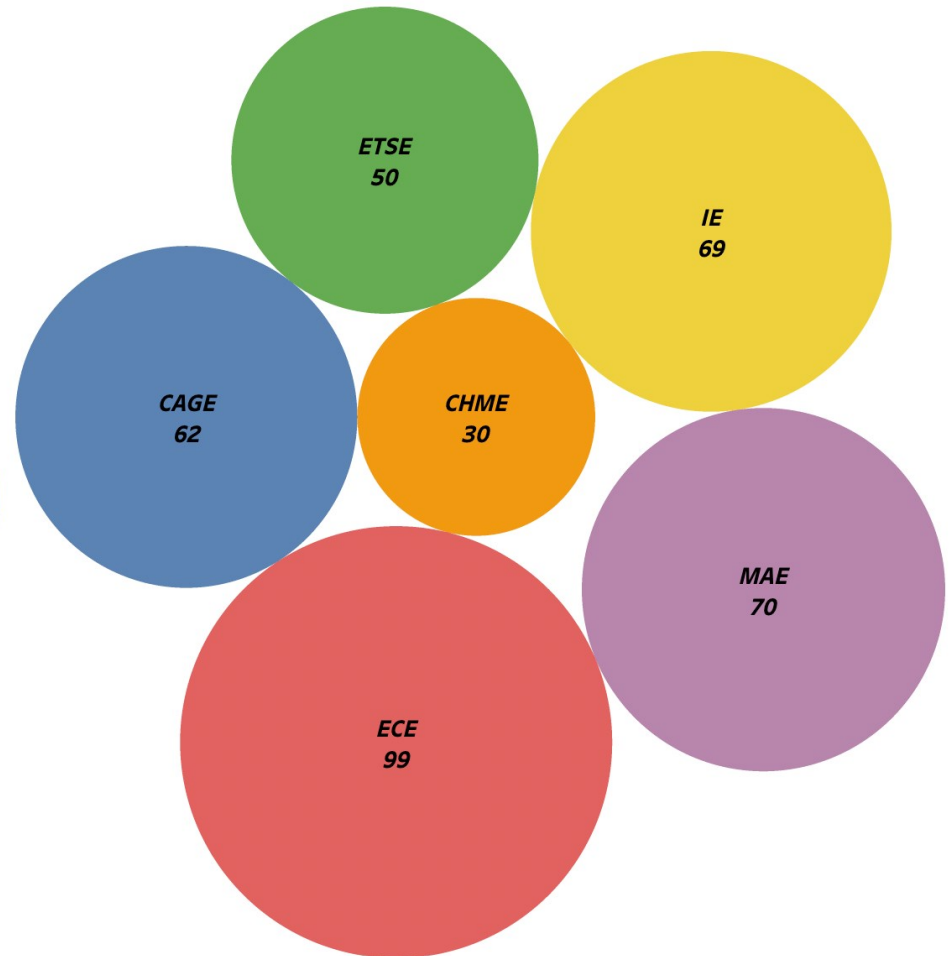


2022 COLLEGE OF ENGINEERING GOAL 1 ACCOMPLISHMENTS

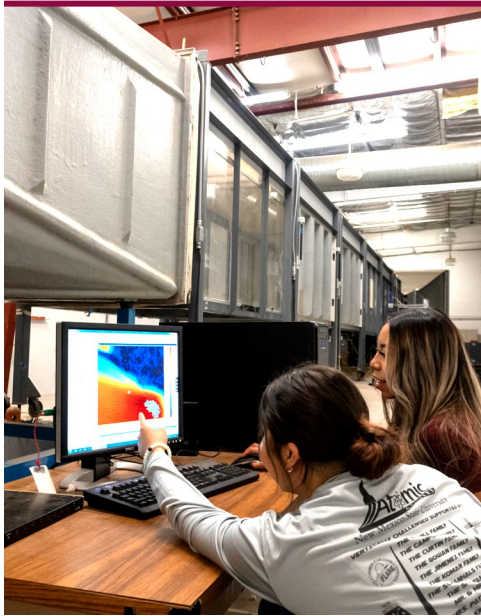
Market Score—National



Graduate Enrollment—Fall 2021



COLLEGE OF ENGINEERING STRATEGIC ROADMAP



The U.S. Department of Defense has granted the college a \$1 million, two-year Defense Established Program to Stimulate Competitive Research or DEPSCoR Award to establish the New Mexico Basic Research Center of Excellence for Hypersonic Sensor Development and Testing.

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



David Mitchell, assistant professor in Electrical and Computer Engineering, recently received the National Science Foundation Faculty Early Career Development award. He will further his academic pursuit of data-compression technologies and encouraging youngsters to pursue a future in science, technology, engineering and math fields.

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

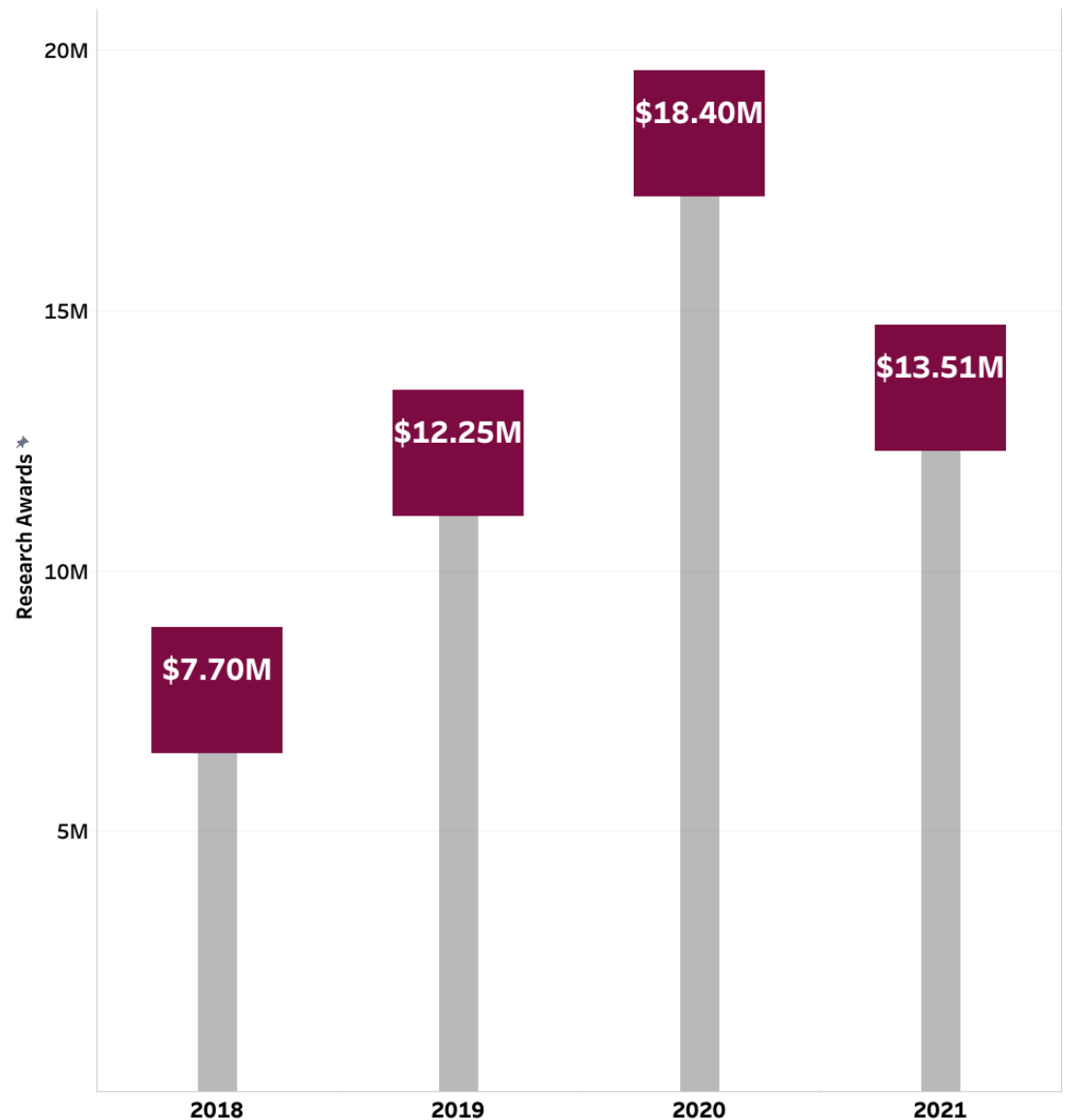
- ⇒ Carlsbad Environmental Monitoring and Research Center
- ⇒ Engineering Research Center for Re-engineering the Nation's Water Infrastructure
- ⇒ Interdisciplinary Center for Research Excellence in Design of Intelligent Technologies for Smart Grids
- ⇒ Center for Bio-mediated and Bio-inspired Geotechniques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

2022 COLLEGE OF ENGINEERING GOAL 2 ACCOMPLISHMENTS

2021 Top New Grant Recipients

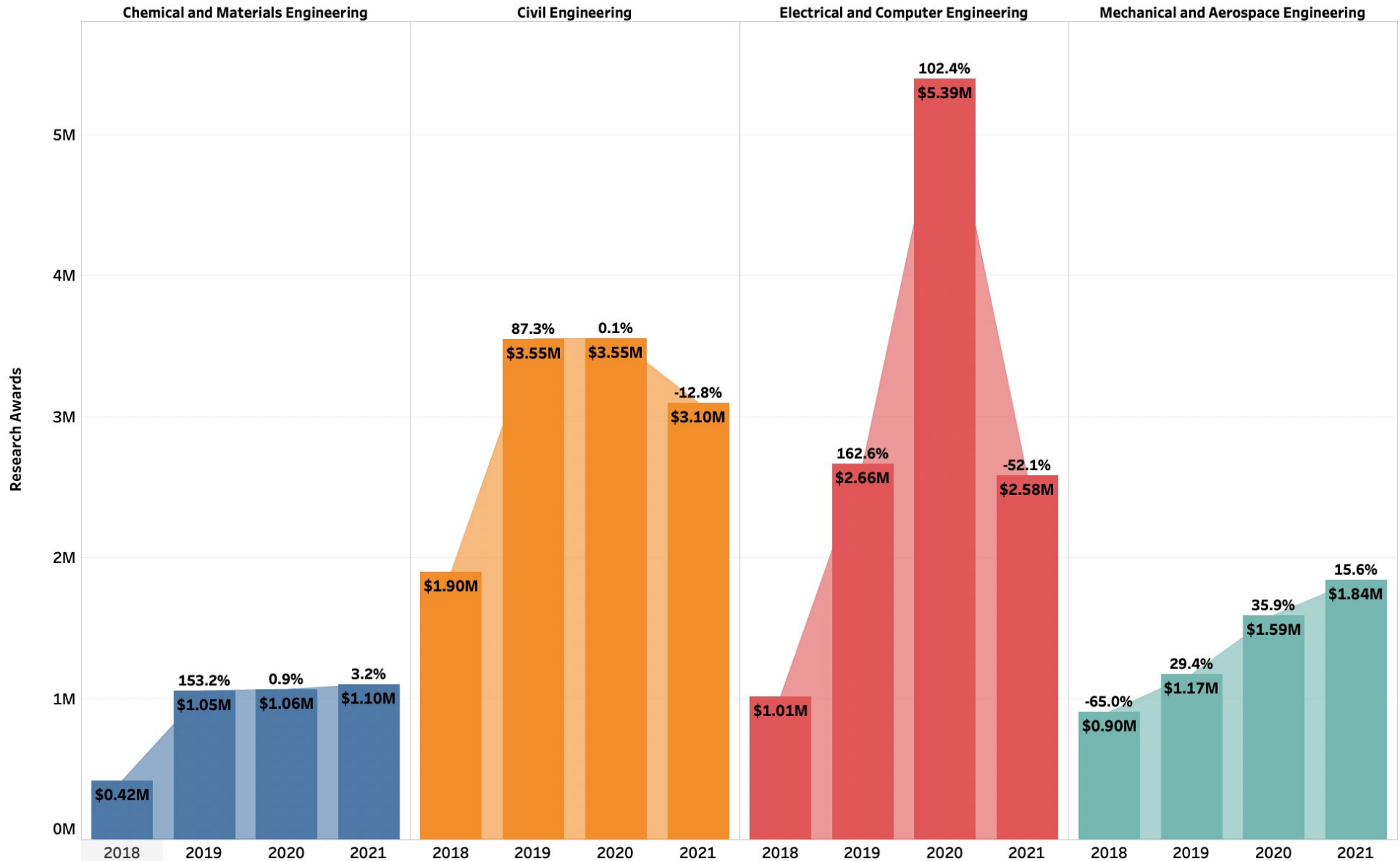
- ⇒ Hongmei Luo, professor, CHME
Purdue University, \$379,247
- ⇒ Young Park, professor, MAE
US Department of Agriculture,
\$500,000
- ⇒ David Jauregui, professor, CE
New Mexico Department of
Transportation, \$997,290
- ⇒ Seyedhamidreza Alaie, assist-
ant professor, MAE
US Department of Health &
Human Services/National
Institute of Environmental
Health Sciences, \$256,981
- ⇒ David Voelz, professor, ECE
Office of Naval Research,
\$299,344
- ⇒ Ehsan Dehghan Niri, assistant
professor, CE
US Department of Energy,
\$2,000,000
National Science Foundation,
\$579,236
U.S. Department of Defense,
\$469,180
- ⇒ Meng Zhou, assistant profes-
sor, CHME
National Science Foundation,
\$325,000

College of Engineering Research Awards



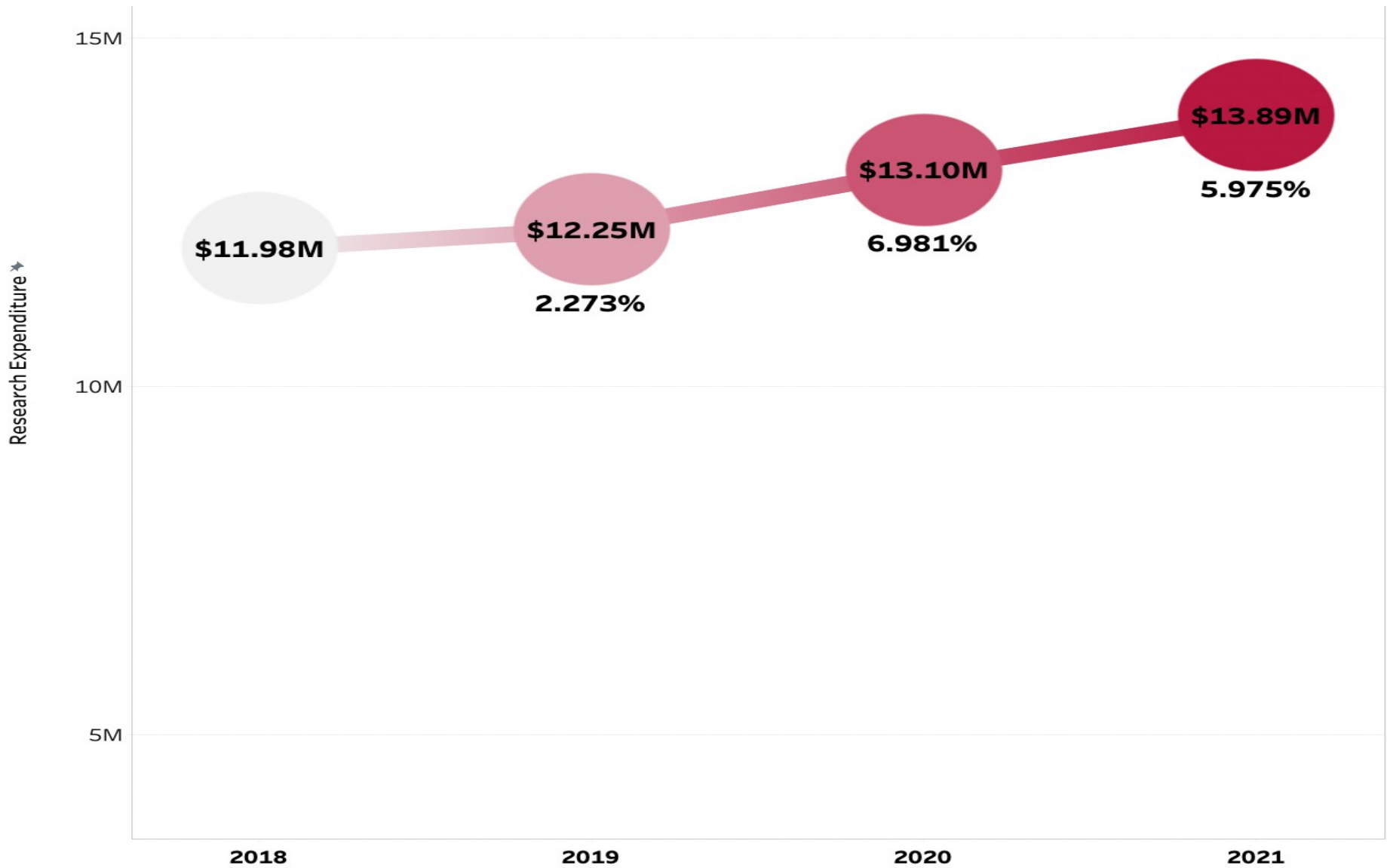
2022 COLLEGE OF ENGINEERING GOAL 2 ACCOMPLISHMENTS

College of Engineering Research Awards by Department



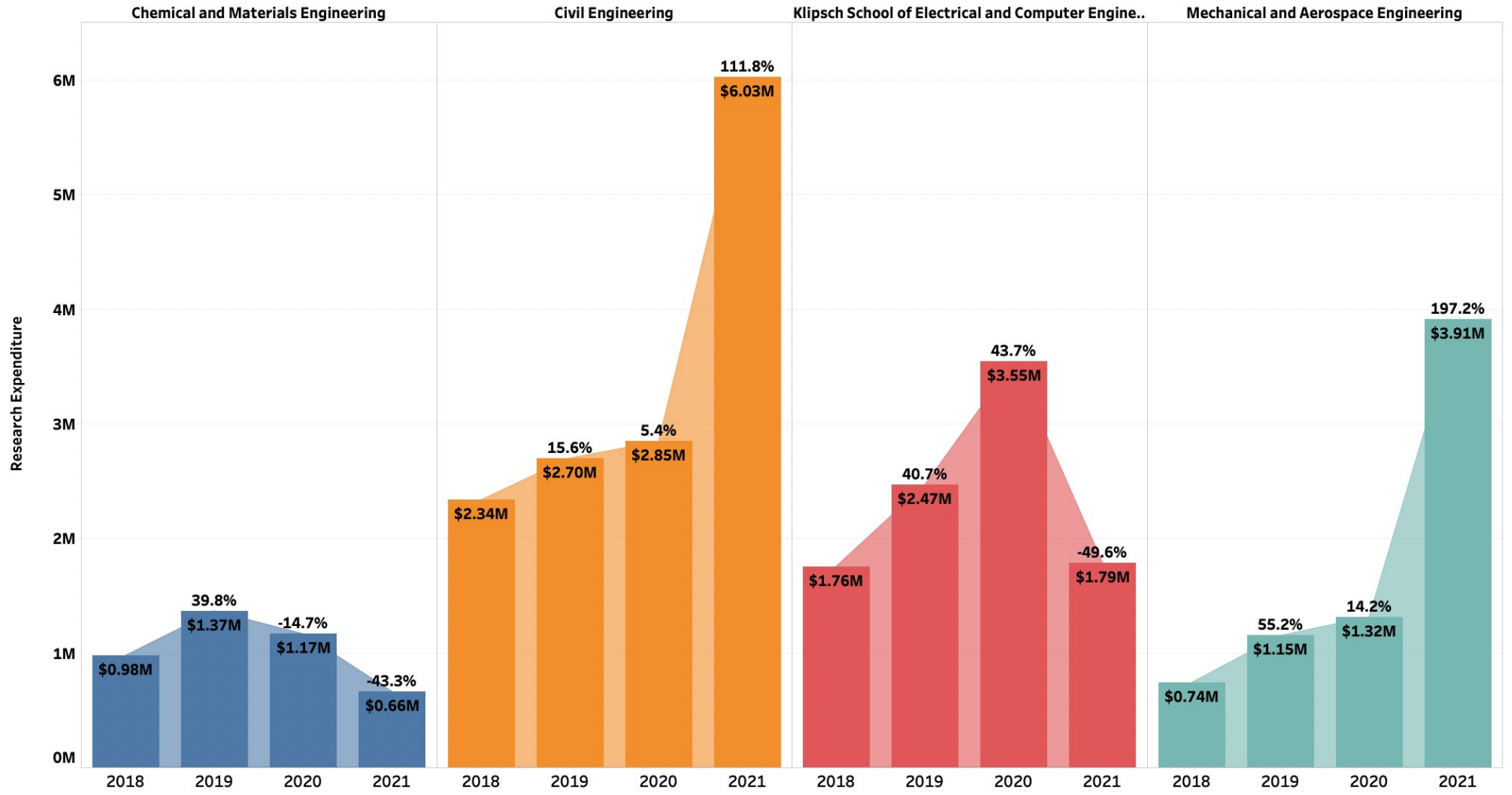
2022 COLLEGE OF ENGINEERING GOAL 2 ACCOMPLISHMENTS

College of Engineering Research Expenditures



2022 COLLEGE OF ENGINEERING GOAL 2 ACCOMPLISHMENTS

College of Engineering Research Expenditures



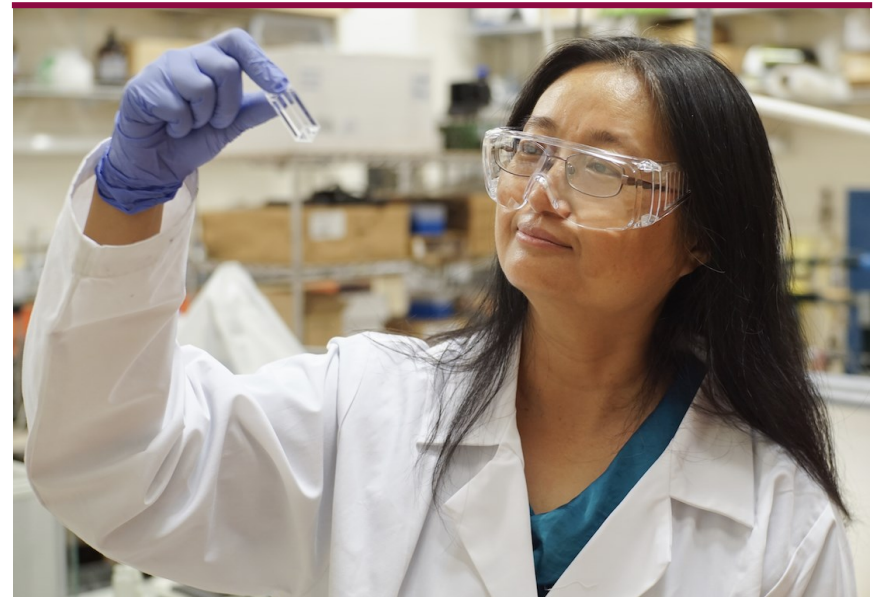
2022 COLLEGE OF ENGINEERING GOAL 2 ACCOMPLISHMENTS

Top 2% Scientists Worldwide in 2021

- ⇒ Abdessattar Abdelkefi, associate professor, MAE
Specialty: aerospace and aeronautics
- ⇒ Jay I. Frankel, department head, MAE
Specialty: mechanical engineering and transports
- ⇒ Nagamany Nirmalakhandan, professor, CE
Specialty: biotechnology
- ⇒ Pei Xu, professor, CE
Specialty: environmental engineering
- ⇒ Tom Manz, associate professor, CHME
Specialty: organic chemistry
- ⇒ Zohrab Samani, professor, CE
Specialty: environmental engineering
- ⇒ David Voelz, professor, ECE
Specialty: optoelectronics and photonics

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 2021 (all fields and overall career).

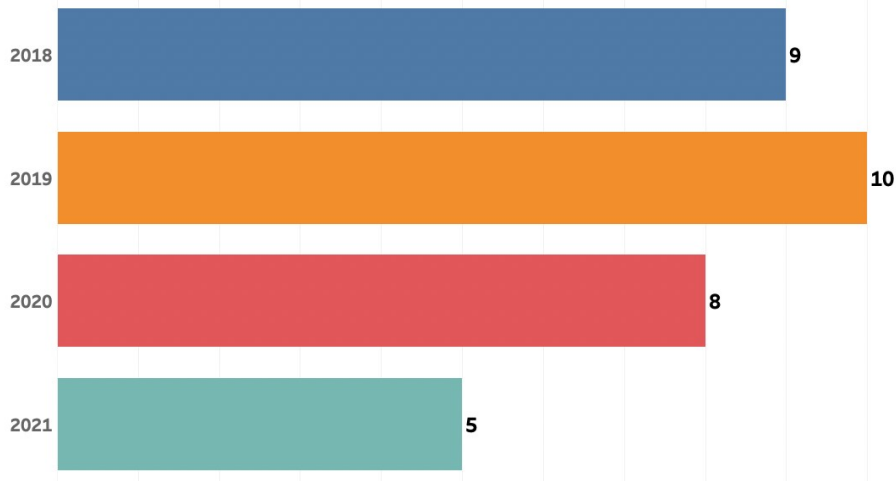


NMSU, in collaboration with the NM Environment Department, is home to the NM Produced Water Research Consortium. Established in 2019 to support NMED's implementation of the Produced Water Act, the consortium is a partnership composed of academia, state and federal agencies, national laboratories, non-governmental organizations and the private sector. Civil Engineering Professor Pei Xu is associate director of research and technology.

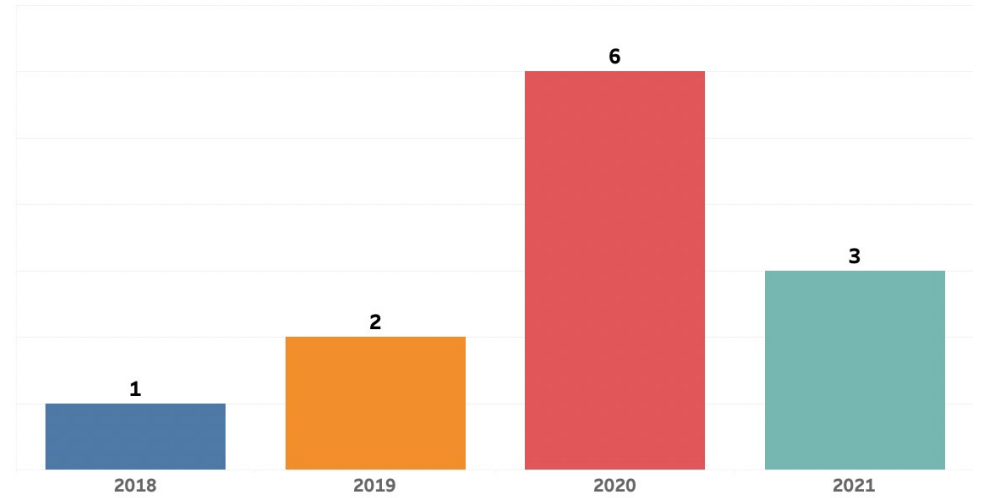
2022 COLLEGE OF ENGINEERING GOAL 2 ACCOMPLISHMENTS

Post-Docs, Research Faculty and Visiting Scholar: College-wide

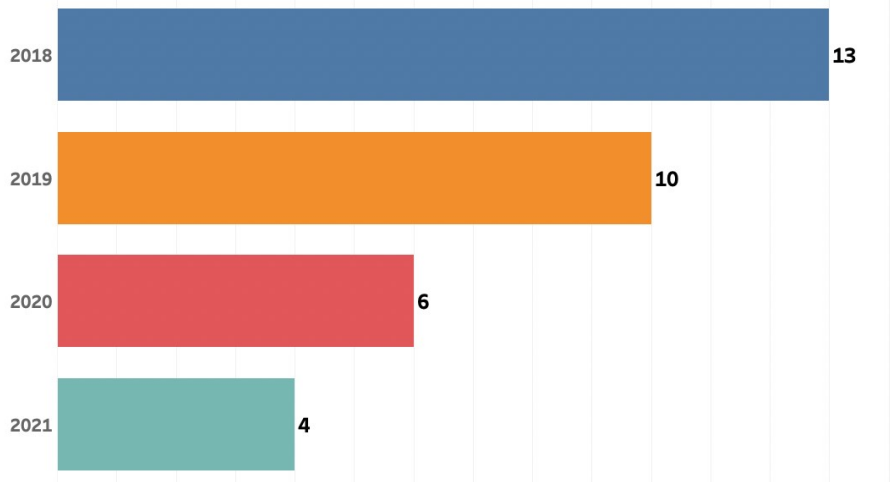
Post-Docs



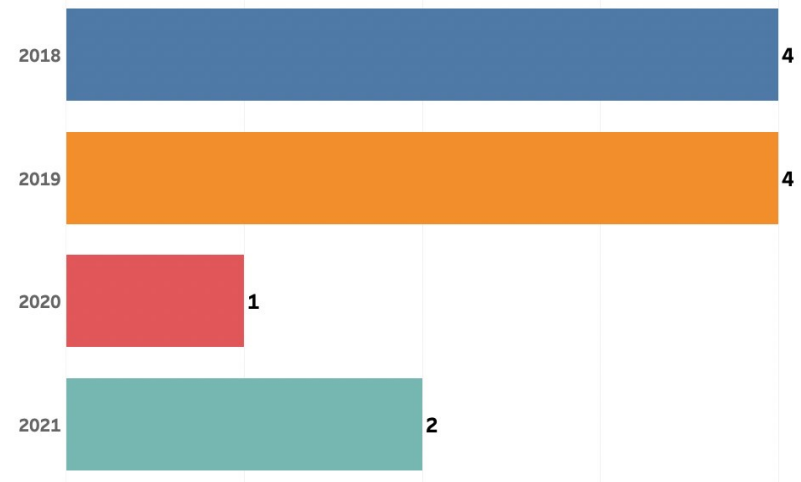
Research Faculty



Visiting Scholars



Visiting Scholars - Non PhD



COLLEGE OF ENGINEERING STRATEGIC ROADMAP



The NM PREP Academy holds on-campus summer STEM programs for middle- and high-school aged students. The Academies are designed to spark student interest in STEM, specifically in engineering, while engaging students in leadership, team-building, and hands-on activities that simulate real-world engineering experiences.

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

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

GOAL 3. KPIs

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

2022 COLLEGE OF ENGINEERING GOAL 3 ACCOMPLISHMENTS

K-12 STEM PROGRAMS

- ⇒ Four formal STEM outreach programs
- ⇒ 1,624 high- and middle-school student participants
- ⇒ 17 school districts served
- ⇒ 18 New Mexico counties served

Engaging a wider community

The College of Engineering provides statewide engineering outreach services by leveraging a network of partnerships with industry, government agencies, K-12 school districts, community organizations, and academic institutions. Programs are recognized for fostering relatable and relevant content that spans K-16 student engagement, business assistance and professional development focused on upskilling, new-skilling and reskilling the current workforce.

Encouraging future students

The college met the challenge of broadening engagement in STEM by elevating program offerings encompassing in-person, online and hybrid delivery strategies to meet students where they are at. The program offerings foster community-based outreach programming by engaging NMSU engineering students as near-peer mentors, engaging faculty for program relevance in current and emerging areas, and engaging industry partners for relevance in real-world application.

Engaging business and industry

Outreach and engagement with business and industry includes partnerships with the New Mexico Economic Development Department and the New Mexico Energy, Minerals and Natural Resources Department to offer a Green Business Webinar series and a Green Business Resource Fair. Additionally, eight businesses participated in the Clean Energy Sprint program offered through a partnership between the College of Engineering and NMSU's Arrowhead Center through a grant funded by the U.S. Economic Development Agency. Another 10 businesses received direct on-site energy efficiency and pollution prevention assessment services.

2021-2022 P2E3 Implementation Results

Greenhouse Gasses Elimination	14,952 MT CO ₂
Water Saving	140,671 Gallons
Energy Saving	4,017,000kWh
Hazardous Material/Solid Waste Reduction	1,164 Tons

2022 COLLEGE OF ENGINEERING GOAL 3 ACCOMPLISHMENTS



New Mexico State University's team of student engineers, E^2M3, placed second at this year's Invent For The Planet (IFTP) international design competition for their project EcoArt.

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.

The Aggie Engineering Capstone Design Program 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.

The college entrepreneurship program, allows 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.

2022 COLLEGE OF ENGINEERING GOAL 3 ACCOMPLISHMENTS



NMSU's team won the FY22 NM Capstone Challenge sponsored by Sandia National Laboratories. Competing were 23 students and their faculty advisors from UNM, NMSU, and NM Tech. This year's goal was to design an efficient 3D-printed cradle that could withstand the accident environment (temperature changes, vibration, and shockwave from explosion). On April 20, students conducted environmental testing at Sandia and gave presentations on April 21.

Capstone Projects and Sponsors: Fall 2021-Spring 2022

Afton Generating Station - Powering the Grid - Solid Problems	PNM
Basin Still with ETFE Engineering Project	NMSU
Callie Baby Bottle	Innovar
Capacitance Scaling/ESD Study	LANL
Data Acquisition System to Enhance Vehicle Testing Capabilities	Honeywell FM&T
Designing, Prototyping, and Testing a Pneumatically Actuated Modular Soft-bodied Robotic Arm	NMSU
Development of a 3-Way Gate Drafting System to Automatically Sort Cattle into Management Groups	NMSU
Fresnel Mirror Tracking Sensors	Focused Sun
Heat Transfer Fluid Circulation	Focused Sun
Increase thrust-to-weight ratio of JetCat P100-RX model turbojet engine	AFRL
Innovating Construction	Zone Innovation
Material Characterization of Carbon Fiber PEEK Material	LANL
Mirror Optimization	Focused Sun
NASA Optical Communications	NASA
NM Capstone Challenge III	SNL
Optical Alignment system	Northrop Grumman
Polymer Additive Manufacturing Pressure Vessels	Kansas City National Security Campus
Robotic Automation for Food Production	NMSU
Satellite Alignment System - Docking	NMSU
Secondary Energy Harvesting	General Dynamics Mission Systems
Ultra Low Power Activity Detection using Camera	SRI International

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

2022 COLLEGE OF ENGINEERING GOAL 3 ACCOMPLISHMENTS



The Engineering Education Enrichment, e3 Initiative, is funded by NSF. Now in its second year, the \$2.1 million grant helps students prepare for entering the job market with career-ready skills and experience.

Gabriel Marinelarena Lozoya, MAE, earned a certificate in team leadership through the e3 Initiative. Then, in preparation for his summer internship with Fiat Chrysler Automobiles, Gabriel completed a Six Sigma Yellow Belt specialization through e3.

Developing workforce-ready engineers

In fall 2020, the College of Engineering launched the Engineering Education Enrichment (e3) program through a grant from the National Science Foundation. This is a pilot program designed to enhance student marketability with career-ready skills and experience. The e3 initiative is designed to engage eligible engineering students in co-curricular learning strategies beyond the classroom. Grounded on increasing self-directed learning skills and hands-on training, e3 engages students in industry mentored design projects, industry-valued certifications and entrepreneurship training (offered in partnership with NMSU Arrowhead Center). To date, the program has engaged more than 198 students, with 110 of these students pursuing at least one certificate program or certification, and connected with 30 industry and national laboratory partners as design project mentors.

Career development programs aim to broaden engagement of students and employer partners. In the 2021-22 academic year, the college offered 37 direct career-development program offerings (resume review, mock interviews, industry information sessions, etc.) in which 1,062 students and 307 employers participated.

Inspiring future engineering leaders

In fall 2019, the college 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 third cohort will begin fall 2022. 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. They have the opportunity to meet with and engage in discussion with well-known leaders in the engineering field.

The students participate in a two-session workshop that include discussions with successful entrepreneurs and a hands-on learning experience led by Arrowhead Center Studio G, NMSU's student business accelerator.

2022 COLLEGE OF ENGINEERING GOAL 3 ACCOMPLISHMENTS



Seidel Engineering Leadership Institute students set out to move 12-cubic yards of garden soil to revitalize the NMSU Community Garden.

The institute also requires students to participate in community service projects to reinforce the idea that engineers serve society and that service goes beyond the workplace. Using a real-world approach, students analyze a project by applying engineering process principles. They then responded to a formal request for proposal with their implementation plans, graphics, labor and materials requirements, budgets, timelines and plans for sustainability.

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.

COLLEGE OF ENGINEERING STRATEGIC ROADMAP



Mark Lawrence, Engineering Technology and Surveying Engineering Assistant Professor received the 2022 College Roush Award for teaching. The award is based upon graduating student votes.

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

- a. 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.
- b. Establish development programs such as peer mentoring, workshops, conferences, training and research symposia for faculty and staff.
- c. Increase faculty and staff recognition with awards, professorships, chairs and staff-ships.
- d. Reward productivity with travel funds, media coverage, flexible teaching loads, graduate assistant allocations, mini-grants and seed grants.
- e. Provide technical support for research proposal development.
- f. Provide avenues for faculty and staff feedback to administration.

Since 2017, engineering faculty and staff members have received \$58K in college awards for research, teaching, mentoring and advising. These awards are supported by private funding.

COLLEGE OF ENGINEERING STRATEGIC ROADMAP



The E. Eugene Carter Foundation supports undergraduate female engineering students, giving priority to first-generation Hispanic women.

Upon graduation their federal loans up to \$20,000 will be repaid from funds provided by the foundation. Two NMSU engineering students received the scholarships and graduated in 2021. Four additional recipients graduated this May including Chance Jaramillo and Maria-Adeliz Ordoñez.

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

STUDENT SCHOLARSHIP SUPPORT 2021-'22

- ⇒ \$541,213 Total Awarded
- ⇒ 606 Student Recipients
- ⇒ 228 Scholarship Funds



Carson Anderson is receiving several engineering scholarships that nearly cover his tuition.

"This support has been a huge and really unexpected blessing in my academic career."

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.

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

2022 COLLEGE OF ENGINEERING GOAL 4 ACCOMPLISHMENTS



Mechanical and Aerospace Engineering Professor Vimal Chaitanya received the Synergy Faculty Leadership Award.

Since 2017, approximately \$58,000 has been awarded to engineering faculty and staff supported by donors who believe they are essential to the success of the college.

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. Engineering faculty and staff members have received a total \$58,000 in awards recognizing their contributions to the college since 2017.

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)

2022 COLLEGE OF ENGINEERING GOAL 4 ACCOMPLISHMENTS

CAPITAL CAMPAIGN FOR THOMAS AND BROWN HALL REPLACEMENT

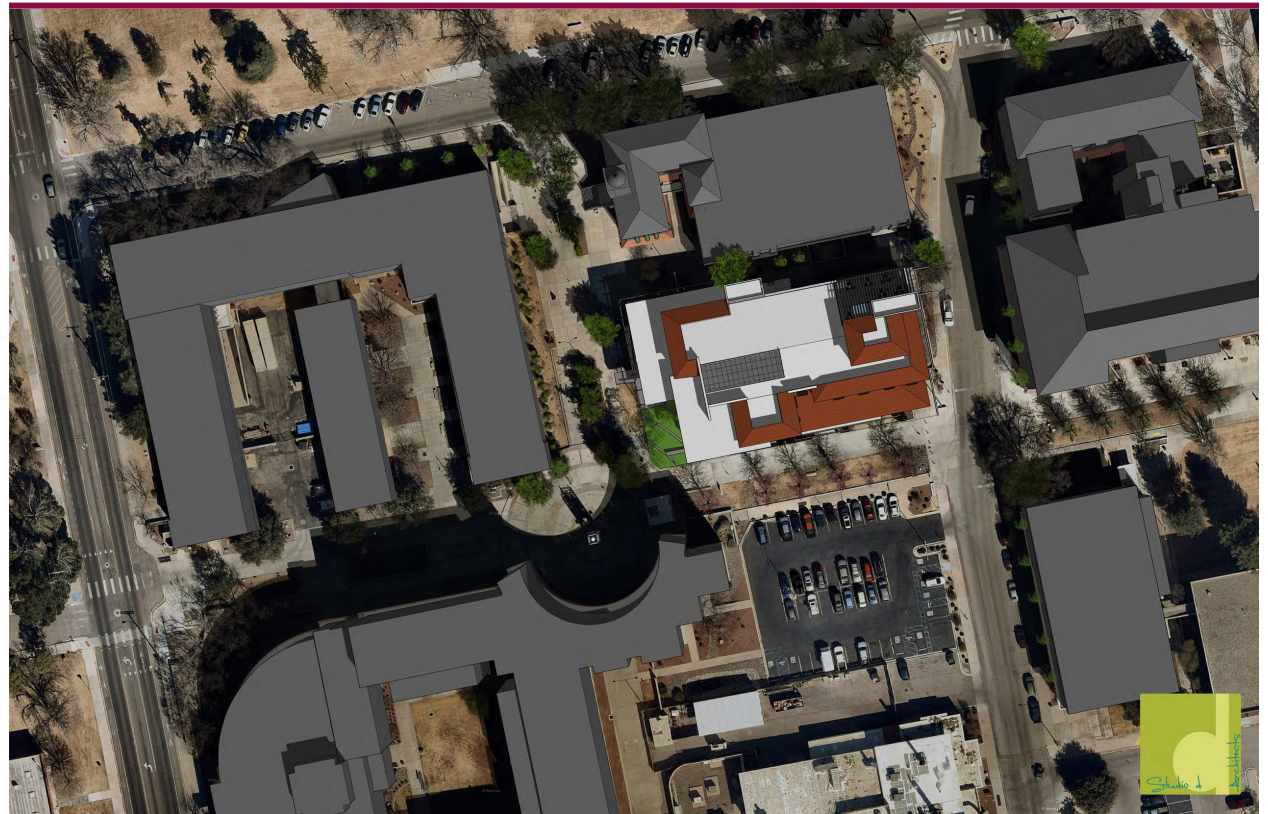
- ⇒ General Obligation Bond: \$20M
- ⇒ Collaborative Learning Spaces and Classroom Revisions: \$5M
- ⇒ Private Gifts: \$5 million



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.



2022 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

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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