

COLLEGE REPORT 2023



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Amanda Shapiro '14, chemical engineering (executive committee member; president)

Erin Threet '06, civil engineering

John Venarchick '00, electrical engineering

Aditi Vijayvergia '21, M'23, electrical engineering

Nancy Wang '16, chemical engineering

Kat Wiley '14, chemical engineering

Ezra Yarnell '98, M'00, civil engineering



I am in my second year as the Richard E. Garman Dean of Engineering at Bucknell, and I can't be any more impressed with and proud of the amazing talent in our college community.

Our students graduate ready to make an impact on the world, our faculty are leaders in their fields, our staff are dedicated professionals and our alumni are always ready to help the next generation of Bucknell engineers.

As we constantly work to keep Bucknell's College of Engineering one of the premier engineering programs in the country with an unwavering commitment to a student-first approach, we are guided by a robust strategic plan that includes four goals:

- **ENHANCE OUR ENGINEERING EDUCATIONAL EXPERIENCE**
- **FOSTER A DIVERSE, INCLUSIVE AND EQUITABLE ENVIRONMENT FOR ALL**
- **CHAMPION OUR DISTINCTIVE IDENTITY**
- **FORTIFY EXISTING CONNECTIONS AND CULTIVATE NEW ONES**

The pages that follow demonstrate how these goals are helping us provide a unique and fulfilling experience for our 700+ students and more than 100 faculty and staff while also enhancing the value of the Bucknell degrees held by our alumni.

Much of my pre-Bucknell career was spent at an institution with a robust graduate program. Upon arriving at Bucknell, I quickly learned that our undergraduates are on par with graduate-level engineers at many other institutions. When observing project outcomes and talking with our students, I often need to remind myself that they are undergraduates — their skill level says otherwise.

I'm especially proud of the many opportunities we make available to these talented students. From the revamped ENGR 100 first-year course to our capstone senior design experience, from our community-building programs that quickly immerse students in meaningful aspects of campus life to the invigorating camaraderie and pride on display each February during E-Week, each initiative serves the greater mission of enhancing the excellence of our college.



Brad Putman

Richard E. Garman Dean of the College of Engineering



ENHANCING OUR ENGINEERING EDUCATIONAL EXPERIENCE

Across the quad or across the pond, Bucknell engineers are granted unique and challenging opportunities for alternative experiences that expand their view of the discipline and the world.



EXPANDING BORDERS

A hallmark study abroad opportunity returns for Bucknell engineering students

International experiences are critical for engineering students who will join multicultural teams and create technologies that will make a global impact. However, according to the Institute of International Education, students in STEM majors often report that a traditional semester-abroad program is too disruptive to their studies. And if engineering-focused study abroad programs aren't often offered through their home institution, many students opt out of this vital opportunity.

Bucknell offers an innovative solution. Engineering in a Global & Societal Context (ENGR 290) is a three-week program that has been specifically designed to give engineering students a study abroad experience without interrupting their academic schedule.

After a three-year hiatus due to the COVID-19 pandemic, ENGR 290 resumed in May 2023. Thirty-six engineering students traveled to London and Dublin where they studied how to engineer systems for healthy living, health policy and economics with a focus on environmental and cultural impacts.

"The itinerary included industry site visits that were interwoven with lectures, presentations and field trips that gave students a social and historical context of the host country," says Associate Dean for Students and Strategic Initiatives Terri Norton. "The result was an immersive experience that enabled students to develop intellectual maturity, informed by an understanding of different cultures and diverse perspectives."

MAJOR GRANTS

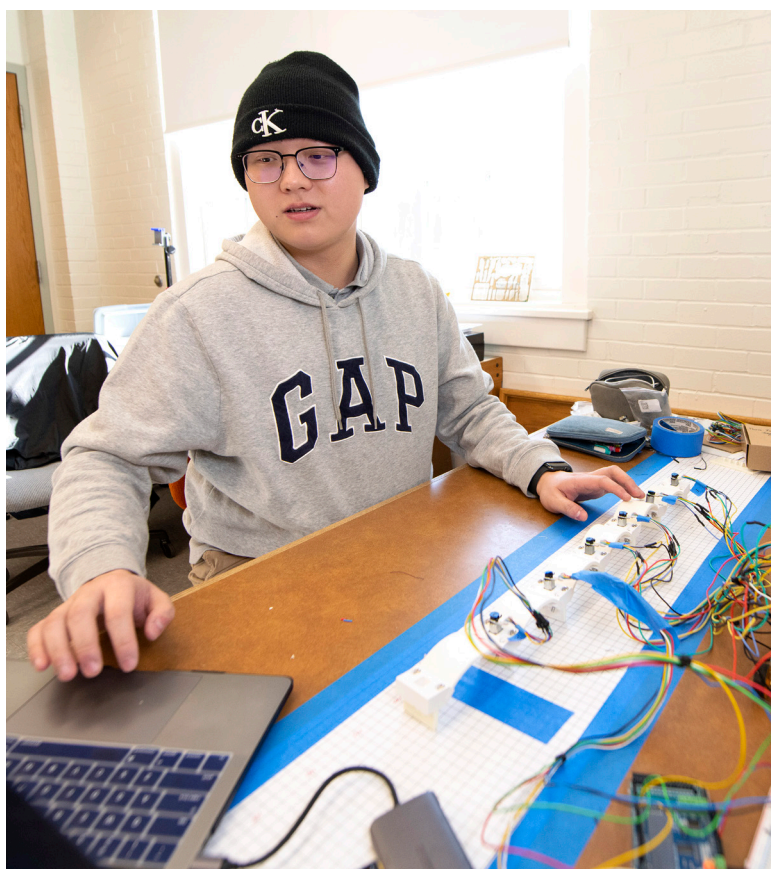
A \$2 million NSF Revolutionizing Engineering Departments grant was awarded to the Department of Electrical & Computer Engineering.

Professor Eric Kennedy, biomedical engineering, received a Department of Defense grant for playground safety certification training.

An Environmental Research and Education Foundation grant propels research on landfill diversion and biogas production for Professor Matthew Higgins, the Claire W. Carlson Chair in Environmental Engineering.

Fact or feeling? Professor Elif Miskioğlu, chemical engineering, uses NSF grant funding to research the expertise-intuition relationship in engineering practice.

Five engineering students received prestigious research fellowships this year: Three NSF grants and Two Goldwater scholarships.



Powerful POTENTIAL

In Bucknell's Dana Engineering labs, Professor William Scott, mechanical engineering, is leading a group of student engineers in soft robotics development, an advancing field that utilizes pliable materials to replicate muscular movements. His researchers are designing robotic devices inspired by the swift zigzagging of eels and the traveling-wave motion of caterpillars.

"We're right at the early stages of creating mechanisms," says Scott. "We're figuring out how they can work and discovering their potential."

Scott's collaborators include **Caiden Covell '25** and **Harry Shi '24** (left), both mechanical engineering majors who are exploring different applications of the experimental field and doing research that could open up ways for soft robotics to interface with highly unpredictable environments — like uncharted ocean depths, dense jungles or rugged terrain.

"They run with ideas and come up with solutions I would've never thought of," Scott says. "It's all really fun."

WHAT A NIFTY IDEA!

The College of Engineering's Nifty Idea fund allows students, faculty and staff to capitalize on the unique capabilities of campus makerspaces by removing the financial barrier to making, designing and building. This microgrant initiative helps new ideas come to life by helping faculty host design/build challenges that provide the spark for entrepreneurial endeavors or supporting students' product ideas (like the highly versatile and customizable guitar pedal created by computer engineering major **Thomas Smith '23** [right]).

"It's been my long-standing dream to create my own guitar pedal," Smith says. "I've always been fascinated by the diverse range of sounds and effects that can be achieved through different pedals." His custom-programmed single pedal replicates the capabilities of an entire pedalboard, allowing the player to combine effects and offering a multitude of options for sound shaping and personalization. The result is a powerful tool for musicians that enables them to craft unique soundscapes and reduces the need for multiple individual pedals.



"THE NIFTY IDEA FUND PROVIDED ME WITH A UNIQUE OPPORTUNITY TO COMBINE MY PASSION FOR MUSIC WITH MY ELECTRICAL ENGINEERING AND COMPUTER PROGRAMMING SKILLS."

Thomas Smith '23

FOSTERING A DIVERSE, INCLUSIVE AND EQUITABLE ENVIRONMENT FOR ALL

Intentional programming cultivates a culture of belonging in the College of Engineering — a continuation of Bucknell's efforts of more than a century.

A CENTURY OF EXCELLENCE

Bucknell Engineering celebrates 100 years of inclusivity

In 1923, **Katherine Owens Hayden P'48** became the first woman to earn an engineering degree from Bucknell. Though the University had been co-educational since 1852, engineering was the last domain on campus for women to access.

"The 100th anniversary of Hayden's graduation is significant," says Erin Jablonski, associate dean of engineering. "Bucknell was progressive, and we are proud of that."

Thousands of women have followed in Hayden's footsteps. Trailblazing alumnae conduct cutting-edge research, make life-changing discoveries and have broken barriers in traditionally male-

dominated roles at companies like SpaceX, Google and Merck.

Today's engineering students join a welcoming environment with encouraging mentors and programs that support their success. The engineering faculty takes intentional steps toward parity to broaden the story of who is successful in engineering through a focus of equity in the classroom.

The college's ongoing collective efforts to advance inclusion and representation will ensure its legacy of excellence for the next 100 years — and beyond.

Terri Norton shares Hayden's experience in being the first.

The associate dean for students & strategic initiatives and professor of civil & environmental engineering (right) was the first woman to graduate with a doctorate from Florida A&M University's Department of Civil and Environmental Engineering and was the first woman to join the construction engineering faculty at the University of Nebraska-Lincoln. When she arrived at Bucknell in 2018, she says she was grateful to be in the company of so many women faculty members.



FOR ALL THEIR SUCCESSES, WOMEN STILL REMAIN UNDERREPRESENTED IN ENGINEERING — BUCKNELL TIPS THAT TREND.

Though women account for **53%** of all undergraduate and advanced degrees, **86%** of science and engineering professionals in the U.S. are men (National Science Foundation).

At Bucknell, women comprise **31%** of engineering students, compared to just **24%** nationally. Women comprise **30%** of the College of Engineering's faculty, compared to **19%** nationally.

Two of Bucknell's six engineering department chairs are women:
Professor Wendelin Wright, mechanical engineering, and Professor Donna Ebenstein, biomedical engineering.

SYSTEMS OF SUPPORT

The Engineering Success Alliance supports students from under-resourced high schools through targeted academic support, mentoring and professional development opportunities.

Engineering Camp is an academically challenging, hands-on introduction to engineering held on campus during the summer for students in grades six through 11.

STEM Scholars recognizes talented prospective and current students interested in science, technology, engineering and mathematics, and provides them with scholarships and ongoing opportunities for research and other experiences.

Garman Guides provides first-year peer mentorship for students in the College of Engineering, highlighting resources and programs that connect students with internship and career opportunities, undergraduate research and design experiences, and the greater Bucknell engineering community.

JUMP START

Under the direction of Associate Dean Erin Jablonski, first-year students gain early exposure to labs, faculty, research and campus culture through the Engineering EXCEerator program. This intensive, hands-on experience invites students to dive into team-based design projects, train on makerspace tools and take introductory coursework before the start of their first semester. Funded by the generosity of donor partners, the endowed program offers a foundational engineering experience at no cost to students.

“The students who participate represent a wide variety of geographical locations, high school environments, intended majors and prior experiences,” says Jablonski. “The program doesn’t do one thing or fill one need. It brings a broad pool of students together to work toward common goals while they build academic and social capital that sets them on a trajectory for success.”



“MY SCHOOL DIDN’T HAVE THE MOST RESOURCES, AND EXCELERATOR MADE IT POSSIBLE FOR ME TO LEARN WHAT I COULDN’T IN HIGH SCHOOL. NOW, I’M MORE COMFORTABLE BECAUSE I HAVE THE SAME FOUNDATION AS MY PEERS.”

Jonathan Cabrera '26

AT HOME

Twity Gitonga '24 knew Bucknell was the place that would help her become a computer scientist and engineer. But because the U.S. embassy had closed during the pandemic, she spent her first semester learning remotely from her hometown of Nairobi, Kenya.

Despite the distance, Gitonga was welcomed into the campus community. Her physics professor, Sally Koutsoliotas, set up “Zoom buddies” so peers could FaceTime Gitonga and “walk” her to class. The experience encouraged Gitonga’s academic and social engagement. When she arrived in Lewisburg the next semester, everything felt familiar. Since then — in classes, research, clubs and the community — she has continually found a deeper sense of belonging.

Gitonga intends to explore ethical justice in technologies and the incorporation of diversity and inclusion in tech spaces. She eventually hopes to launch her own startup. “When I think of an idea to improve society, I’ll be able to run with it,” she says. “Bucknell gave me that opportunity.”



CHAMPIONING OUR DISTINCTIVE IDENTITY

In Bucknell's College of Engineering, our liberal arts roots allow us to offer opportunities that are as distinctive as the students who call the University home.



"This trip taught me to view sustainability as a direction of innovation for companies from which they can create competitive advantages rather than a set of regulations they need to abide by. I learned to see sustainable change as the focal point of everything in the world around me."

JACK CASTURO '24
Electrical Engineering

CROSSROADS: SUSTAINABLE MANAGEMENT & TECHNOLOGY

Led by Professor Peter Jansson, electrical engineering, and Professor Neil Boyd, management & organizations, Sustainable Management and Technology in Costa Rica is a robust, three-week program focused on renewable energy and the infusion of sustainable development goals (SDGs) in organizations and across organizational forms.

With Jansson's expertise in renewable energy, he offers explanation and narrative as students tour the country's electrical energy facilities and learn about the hydroelectric, volcanic geothermal, solar and wind technologies that power nearly 98% of its energy needs. "We meet with the national electric utility as they institute renewable energy across the entire

country, visit the main Ministry of Costa Rica that runs the SDG program for the United Nations, and learn how various entities are infusing economic, social and environmental justice through their missions," Jansson says. "And then of course we're engaging with ecotourism as well — students may participate in sustainable agriculture practices or help to protect leatherback turtles on the west coast by studying microplastics on the beach and advocating for change."

The course includes site visits to active government, non-government and private-sector organizations, universities, energy facilities, and historical, cultural and natural sites where students learn about SDGs across business entities.

ENGINEERING FOR INCLUSION

The College of Engineering places a special focus on engineering for social good, offering classes that focus specifically on how the work of engineers and computer scientists can increase equity and inclusion.

One such course taught by Professor Anne Ross, computer science, provided students the opportunity to learn about disability rights and societal and systematic barriers to access. It brought first-person stories to the forefront, highlighting the significant role of disabled people in technical innovation.

Students then applied their learning in a makerspace-style lab where they transformed three children's toys into accessible versions for children with disabilities. The students witnessed the impact of their work during a community event at the Lewisburg Children's Museum, where they demonstrated the modification process and gifted the toys — bubble machines, anamorphic penguins and light projectors — to children.

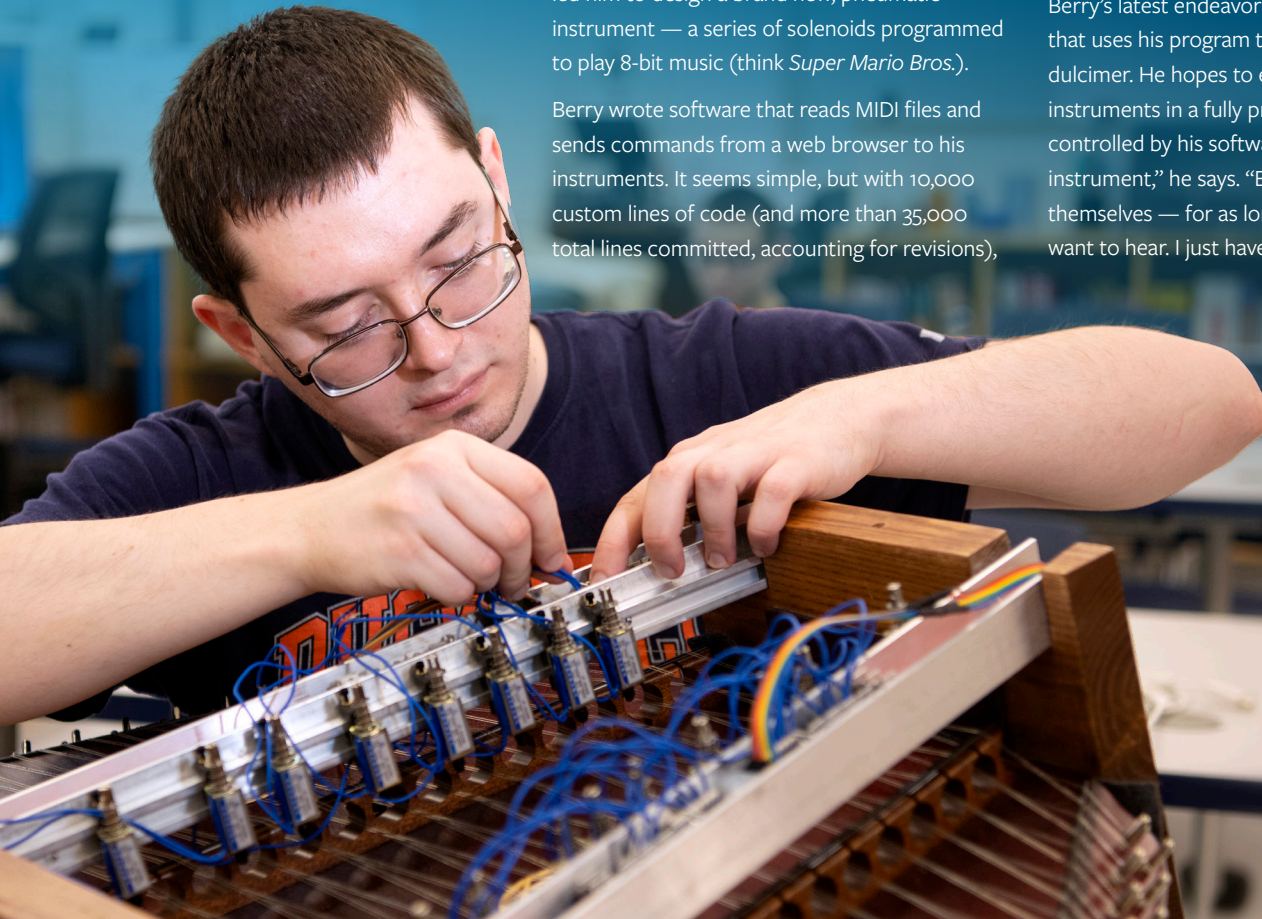
MECHANICAL MUSIC

Electrical engineering major **David Berry '24** is infatuated with the creation of music via electronic means. His curiosity and ingenuity led him to design a brand new, pneumatic instrument — a series of solenoids programmed to play 8-bit music (think *Super Mario Bros.*).

Berry wrote software that reads MIDI files and sends commands from a web browser to his instruments. It seems simple, but with 10,000 custom lines of code (and more than 35,000 total lines committed, accounting for revisions),

the system is far from elementary. “That’s the coolest part,” he says. “The code drives everything.”

Berry’s latest endeavor is an electronic device that uses his program to play a hammer dulcimer. He hopes to eventually have up to 100 instruments in a fully programmable orchestra controlled by his software. “I can’t play a single instrument,” he says. “But I can make them play themselves — for as long as I want, any song I want to hear. I just have to do a little tweaking.”



PET PROJECT

Meet Doug, a three-legged golden retriever who has made his mark on Bucknell engineering.

When his veterinarian recommended a prosthetic for support, Doug’s owner, **Mary Ann Sigler Stanton '89**, who works in the University’s advancement office, knew where to turn: the College of Engineering. Three students — **Grace Adams '23** (right), biomedical engineering; **Will Carcieri '23** (center), mechanical engineering; and **Emma O’Shea '23** (left), biomedical engineering — were eager to take on the pet project.

The students are members of e-NABLE, an organization that creates free, 3D-printed prosthetics for those who need them. Bucknell’s e-NABLE chapter usually creates human prosthetics — so designing a canine leg presented unique challenges. “We have to make it comfortable so Doug will want to wear it,” Adams says.

Their efforts open the door for future students to make adaptations to keep up with Doug — and potentially aid other pets with similar conditions.



FORTIFYING EXISTING CONNECTIONS AND CULTIVATING NEW ONES

Bucknell engineers gain real-world experience through a powerful network of alumni and professional partners.

INGENUITY AT WORK

Senior design creates real-world impact through corporate partnership

Each year, seniors across the College of Engineering collaborate on design projects that make real-world impacts for a range of companies and organizations, including Keurig Dr Pepper, Corning Incorporated, the regional Geisinger health system and local food and beverage manufacturers.

The program is a win-win: Engineering students apply skills and knowledge they've accumulated in Bucknell classrooms while receiving ongoing feedback from industry professionals. Corporate partners tap into a pool of high-performing students with fresh perspectives and access to expert faculty and state-of-the-art resources.

"The hands-on opportunities Bucknell engineers receive by working with our senior design partners is extremely beneficial," says Brad Putman, the Richard E. Garman Dean of the College of Engineering. "They develop teamwork, communication and leadership skills, while having professional interactions and taking that next step toward success post-Bucknell."

Each team's ultimate goal? To deliver a well-conceived prototype that can become an actual product or initiative that ends up in the

marketplace. And it happens. Bucknell-engineered designs have resulted in several patents, including a syringe that allows emergency responders to administer a drug to patients in volatile environments like helicopters.

"In class, you are usually solving an idealized textbook problem that is pretty straightforward and generally has a simple solution," says **Maddie Sanders '23**, a mechanical engineering major (above). "With this project, we develop plans we think will work, but then things go wrong. Or we find success once but struggle to replicate it. We need to manage all of that while continuing to move the project forward."

By the numbers

Since its inception, 3,000 senior engineering students have worked with more than 300 companies and institutions on more than 700 projects. This year, more than **80%** of the projects are sponsored by external organizations, many of which are repeat collaborators.

SELECTED CORPORATE PARTNERS

Corning Incorporated
ExxonMobil
Frito Lay
Geisinger
Johnson & Johnson
JLG Industries
Keurig Dr Pepper
PepsiCo
Procter & Gamble



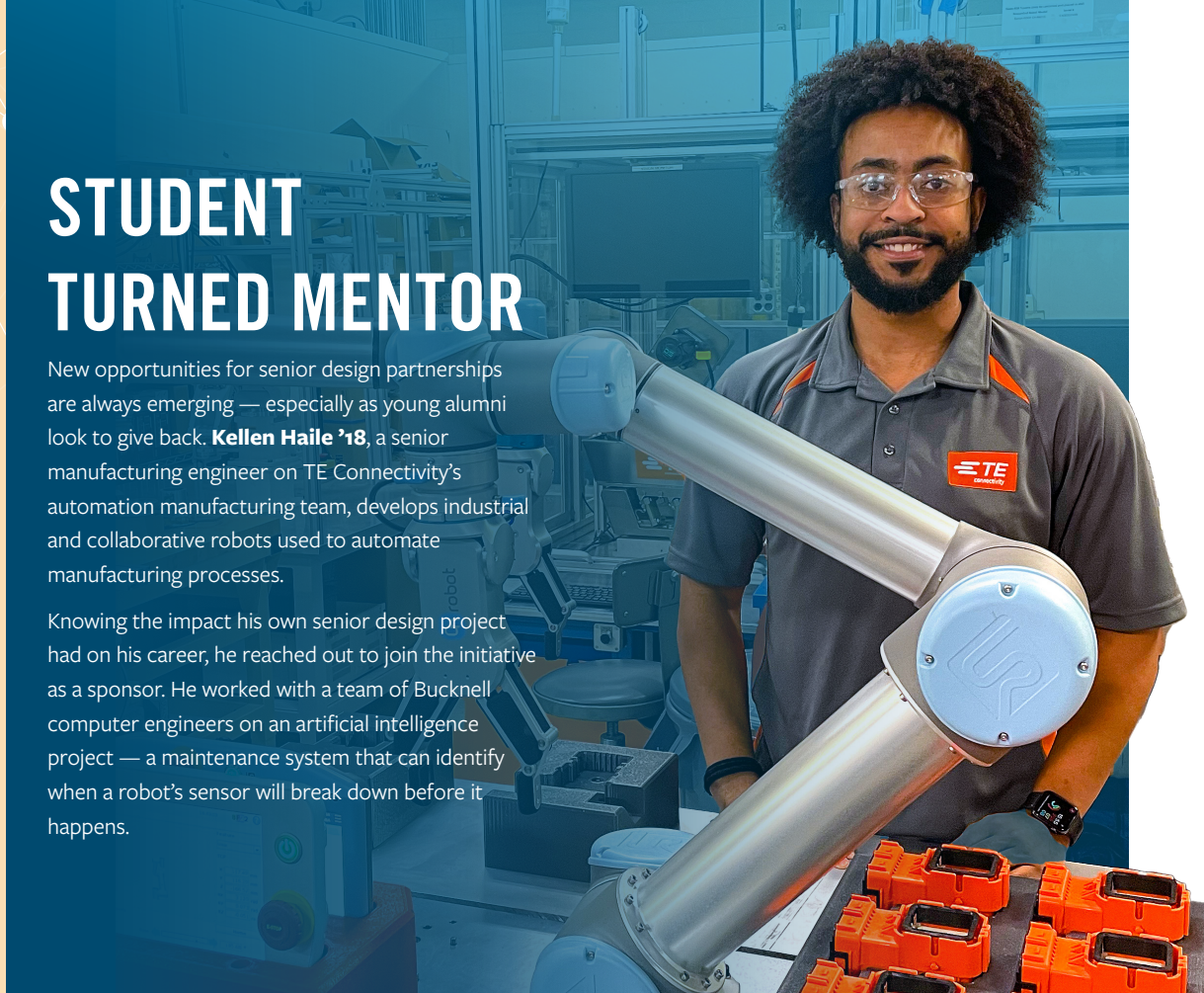
CONNECTING TO HEALTHCARE

The College of Engineering's partnership with regional health care provider Geisinger creates opportunities for hands-on learning, broadens research, grows cross-college programming and enhances clinical exposure opportunities for students — and it's all aimed at creating the next generation of compassionate, innovative health care professionals.

STUDENT TURNED MENTOR

New opportunities for senior design partnerships are always emerging — especially as young alumni look to give back. **Kellen Haile '18**, a senior manufacturing engineer on TE Connectivity's automation manufacturing team, develops industrial and collaborative robots used to automate manufacturing processes.

Knowing the impact his own senior design project had on his career, he reached out to join the initiative as a sponsor. He worked with a team of Bucknell computer engineers on an artificial intelligence project — a maintenance system that can identify when a robot's sensor will break down before it happens.



WIND POWER

In collaboration with Harmony Turbines, mechanical engineering professors Nate Siegel (above right), the Heinemann Family Professor in Engineering, and **Craig Beal '05** engaged in research involving a new small-scale vertical axis wind turbine installed on the roof of Academic East. Under their mentorship, four undergraduate researchers — including **Grace Lostak-Baker '23**, a mechanical engineering major from Dallas (above, left) — developed a test system for the turbine and are collecting data to measure its output and efficiency.

A Banner Year

THE COLLEGE OF ENGINEERING CLASS OF 2027 GIVE US YET ANOTHER OPPORTUNITY TO WATCH OUR PROJECTS AND PROGRAMS CATAPULT STUDENTS TOWARD ACHIEVEMENT. YEAR AFTER YEAR, WE BENEFIT FROM OUR PASSIONATE AND ENGAGED ALUMNI WHO ALLOW US TO EXPAND OUR ACADEMIC OFFERINGS THROUGH THEIR GIVING, PARTNERSHIP AND BELIEF IN THE MOMENTUM OF OUR COLLEGE.

GIVING IMPACT

70 TENURE TRACK FACULTY

8 ENDOWED CHAIRS/ PROFESSORSHIPS AND FACULTY FELLOWS

- **Professor Donna Ebenstein**, William C. & Gertrude B. Emmitt Memorial Chair in Biomedical Engineering
- **Associate Professor Amal Kabalan**, T. Jefferson Miers Chair in Electrical Engineering
- **Associate Professor Ryan Snyder**, Robert L. Rooke Chair in the Historical & Social Context of Engineering
- **Associate Professor Deborah Sills**, Claire W. Carlson Chair in Environmental Engineering
- **Professor Nate Siegel**, Heinemann Family Professor in Engineering
- **Professor Kat Wakabayashi**, Robert L. Rooke Professor in Engineering
- **Associate Professor Darakhshan Mir**, John P. & Mary Jane Swanson Professor in Engineering & the Sciences
- **Assistant Professor Theo Hopper**, Emmitt Memorial Professor of Instruction in Biomedical Engineering

FUNDS RAISED

Fiscal Year 2023

Gifts	\$1,359,176
Matching Gifts	\$48,672
Pledges	\$356,027
Total	\$1,763,875

FINANCIAL AID

59%

of students received Bucknell aid (need-based, merit or a combination of both)

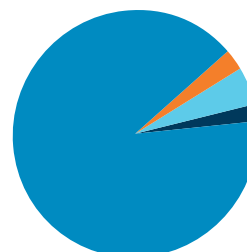
62%

of students received any aid (including grants, scholarships, loans and outside aid)

\$21,724

average federal student loan debt for the Class of 2022 among those who borrowed (compared to about \$30,000 nationally)

DONORS



- Alumni: \$917,004
- Corporations, Foundations and Organizations: \$89,772
- Parents: \$351,481
- Others*: \$405,618

*Students, staff and other individuals

COLLEGE STATS


732 

*Total Full-time
Undergraduate Enrollment*
Academic Year 2022-23

94% 
FIRST-YEAR RETENTION RATE

89% 
SIX-YEAR GRADUATION RATE



More than
7,700  **ALUMNI**
living engineering graduates



43 **ENGINEERING
FACULTY**

**HAD RESEARCH PUBLISHED IN AT LEAST
70 publications in 2022-23**

ENGINEERING FUND SUPPORTED IN 2022-23:

- More than \$100,000 for faculty and staff professional travel
- Nearly \$35,000 for student conference, presentation and professional travel
- Thirty different student trips to 10 states, three countries and Puerto Rico
- \$30,000 for biomedical engineering Cell and Tissue Culture Lab equipment
- Wages for Engineering Study Spot tutors
- **The Rowland E. Bell '59 Entrepreneurship & Innovation Fund** supported in 2022-23: BizPitch, Engineering Student Board bowling activity, Engineering Super Bowl Party, Engineering Student Picnic, Entrepreneurship & Innovation Affinity House

CLASS OF 2027 STUDENT STATS

2,682  **APPLICANTS**

871 ADMITTED
32.5% admit rate

167* ENROLLED
19.2% enroll rate

*As of Sept. 18, 2023



19 countries
and **26 U.S. states**
represented (plus Washington, D.C.)



27.5%
STUDENTS OF COLOR



36% Female

64% Male



BUILDING ON A STRONG FOUNDATION

College of Engineering graduates enter the job market with a combination of technical skills and a holistic mindset that helps them create value not only as engineers, but as well-rounded professionals whose perception of the world has been shaped by Bucknell's interdisciplinary curriculum. Nine months after graduation, the Center for Career Advancement surveyed the Class of 2022 to learn about the success they found in their first year in the field.

> **U.S. NEWS & WORLD REPORT ONCE AGAIN FOUND THE COLLEGE OF ENGINEERING TO BE A LEADER AMONG UNDERGRADUATE ENGINEERING PROGRAMS.**

No. 7

OVERALL
RANK*

No. 3

CIVIL
ENGINEERING

No. 3

MECHANICAL
ENGINEERING

No. 4

ELECTRICAL
ENGINEERING

No. 5

COMPUTER
ENGINEERING

*Among schools not offering doctorate degrees

> **COLLEGE OF ENGINEERING CLASS OF 2022 OUTCOMES**



95%

EMPLOYED, IN GRADUATE SCHOOL
OR VOLUNTEERING



\$79,162

AVERAGE STARTING SALARY

\$145,000

HIGHEST STARTING SALARY FOR 2022
ENGINEERING GRADUATES



KELSEY HERRMANN '09

Using problem-solving skills she honed at Bucknell, **Kelsey Herrmann '09** helps orchestrate a critical mission for NASA. As a flight director, Herrmann is part of a team of scientists working on the Artemis lunar rover, the Volatiles Investigating Polar Exploration Rover (VIPER). In late 2024, VIPER will embark on a 100-day mission to explore the extreme environment of the South Pole of the moon. The information VIPER will collect will help NASA scientists better understand what resources are available for future human missions.

"We'll be looking to understand the components of the moon's water, which is not the water that we experience here on Earth," she says. "And it will be the first time that we will be remote-control driving on another celestial body. Being part of that is pretty cool."



STARTING SALARY BY MAJOR Class of 2022 Graduate Outcomes Survey

\$70,158

Biomedical Engineering

\$75,267

Chemical Engineering

\$74,294

Civil Engineering

\$94,000

Computer Engineering

\$103,591

Computer Science
& Engineering

\$72,813

Electrical Engineering

\$70,333

Environmental Engineering

\$76,265

Mechanical Engineering



TOP EMPLOYER INDUSTRIES

48%

Engineering

14%

Computer Science
or Technology

10%

Construction

9%

Consulting

5%

Health Care

Bucknell's Next Frontier

Bucknell's College of Engineering is home to innovation, creativity and discovery — and it's all propelled by the generosity of Bucknellians. Whether supporting out-of-classroom experiences, funding research opportunities, or contributing to the continuation of diversity, equity and inclusion efforts, our alumni, parents and friends of the college make our excellence possible.

We invite you to consider making a gift to our top funding priorities:

- The Engineering Fund
- 100 Years of Women in Engineering Scholarship Fund
- BEAA Transformative Engineering Education Fund
- Engineering Success Alliance Program Endowment

MAKE YOUR MARK ON THE BUCKNELL COLLEGE OF ENGINEERING.



GIVE.BUCKNELL.EDU/ENGINEERING



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 Bucknell University College of Engineering