NDSU | COLLEGE OF ENGINEERING

FALL NEWSLETTER

NORTH DAKOTA STATE UNIVERSITY

2020

Nearly 300 eighth-grade girls visited NDSU for Introduce a Girl to Engineering Day 2020.

ON THE COVER

The College of Engineering began offering a minor in robotics in fall 2020. The program is open to any student in the college and is designed to give them the skills needed to design and develop robotic devices and use those devices to solve real-life problems.

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DEAR ALUMNI AND FRIENDS OF THE COLLEGE OF ENGINEERING,

The start of fall semester is always one of the most exciting times on campus. This year, that excitement was mixed with uncertainty and apprehension, as we launched classes and continued our important educational and research mission amid the COVID-19 pandemic. Most students, faculty and staff are back on campus, but we are not back to business as usual. We're wearing masks, canceling events and large gatherings and using virtual communication tools, like Teams and Zoom, to limit face-to-face meetings.

The pandemic also means new challenges and opportunities in the classroom. This fall, NDSU launched the HyFlex Educational Model, where technology-enhanced hybrid learning allows students and faculty the flexibility to fully interact in person or remotely. There is room for improvement, but, overall, students have responded positively, with some now saying they prefer to attend class remotely. I believe the HyFlex model will benefit the college and university for years to come.

Another important effort that will benefit the college and university is the implementation of our 2020-2025 Strategic Plan. This document is the result of more than a year of hard work by staff, faculty, alumni and students and will guide our decisions during the next five years. We're in the process of developing digital scorecards to track progress on our strategic initiatives in real time and realize our vision to be the engineering college of choice for students, faculty and employers seeking to enhance society through leadership and innovation.

One of the key parts of our strategic plan is a renewed focus on diversity, equity and inclusion. Unfortunately, we in the engineering and academic community are not immune to biases toward and the suppression of minority students, colleagues and voices. Which is why, as a community, we must strive to treat each other better and empathize with each other, especially with individuals in our underrepresented communities.

"We are Inclusive" is one of the four core values identified in our strategic plan and our intent is to cultivate an inclusive and welcoming environment for all. We must be proactive about diversity.

Earlier this academic year, we began working on a Diversity, Equity and Inclusion Plan for the College of Engineering. In the coming months, we will share and refine that plan and follow through on several initiatives, including increasing support for minority students.

Finally, I would like to acknowledge our faculty and staff for their extraordinary efforts and can-do attitude during these last several months. When I'm asked what makes me the most proud as the dean of engineering at NDSU, my answer is, hands down, the outstanding people in this college who work hard every day to meet our mission of preparing innovative problem solvers and creating new knowledge to improve lives in North Dakota and beyond.

Thank you for your support for the College of Engineering. Go Bison.

Michael R. Kessler

Dean, NDSU College of Engineering

COLLEGE OF ENGINEERING EARNS DIVERSITY AWARD

The NDSU College of Engineering received a Bronze Award from the American Society for Engineering Education Diversity Recognition Program. The honor means the NDSU College of Engineering is among the nation's leaders in inclusive excellence.

"Knowing that we are far better together, we've made diversity and inclusivity core values of the College of Engineering," said Michael Kessler, dean of engineering. "While this award is a recognition of some of our recent progress, more importantly, it's a reminder of the work we still have to do."

Kessler said increasing the number of women and underrepresented minority students and faculty and achieving silver status in the recognition program are among the performance goals included in the college's new strategic plan.

The ASEE Diversity Recognition Program was created to publicly recognize engineering colleges that make "significant, measurable progress in increasing the diversity, inclusion and degree attainment outcomes of their programs," according to the program's website.

The program will eventually include three levels of achievement: bronze, silver and gold. Bronze is the highest level currently being awarded.

ENTREPRENEURSHIP AT NDSU IS 'SHAPING WHERE I WANT TO GO'

NDSU IS A PLACE WHERE STUDENTS CAN PURSUE THEIR PASSIONS AND MAKE THEIR IDEAS A REALITY.

"NDSU has an atmosphere where a student can be a voice for something they think is important. That's definitely been my experience," said Timothy Straus, who recently graduated with a manufacturing engineering degree. "Anyone who is passionate about something can find a venue for rallying people around that idea here."

Straus' academic adviser encouraged him to pursue his passion for innovation early in his college career. That advice helped him connect with NDSU students who share the same interests and become a Stanford University Innovation Fellow. Stanford fellows push innovation and work as change agents to enhance their university.

These experiences set him up to be part of a winning team in NDSU's Innovation Challenge. And through his involvement in NDSU's 3D printing club, he helped win a grant to transform NDSU's 3D printing lab. The space is now the Digital Fabrication Lab which offers the use of a variety of 3D printers, CNC mills and hand tools.

"I don't think I would be in the role that I am without my experience with NDSU's clubs, the Innovation Challenge and makerspace development," Straus said. "It's really shaping where I want to go."

USING TECHNOLOGY TO ENHANCE ROAD SAFETY

North Dakota is a major transportation hub. Vehicles of all sizes and shapes use the state's highway system to transport goods to and from markets. Monitoring that traffic to develop more "intelligent transportation systems" is the goal of research by Ying Huang, Welch Faculty Fellow and associate professor in civil and environmental engineering.

"We have used various sensors to make our roads and cities smarter," Huang said. "We're looking for new ways to use technology to enhance safety and make our models more responsive to actual traffic patterns."

Huang and her research team developed specialized machine learning algorithms to classify vehicles based on traffic data collected from embedded 3D sensors that combine multiple tracking devices into one system.

"Our newly developed technology is a game changer," Huang said. "We have created a proof of concept tracking system that has been piloted with the Minnesota Department of Transportation on a test section of I-94," she said. "This integrated system is designed to last as long as that section of pavement, doesn't require a technician on-site and has a reasonable cost."

MAKING BIG DATA PRACTICAL

People involved with agriculture and hydrology know their decisions need to be data driven. But when dealing with climate-induced changes to soil and water, the data sets are often huge and unwieldy, making them difficult to use and without the detail that is helpful for decision making.

Anne Denton, professor in the NDSU Department of Computer Science, has developed new methods for assessing the remotely sensed data and created models that can analyze the data at the level of one meter or five meters, rather than the traditional 30-meter grids.

"We can use the high resolution of modern imagery for extracting information that involves many pixels of those images," Denton said, "and we can do the analysis without losing any of the resolution."

Using the tools of big data, her research can now provide more accurate, detailed information about topographical features; for example, the slope of a hill, which will help a farmer or hydrologist better plan for handling surface water runoff.

UNDERGRADUATES DEVELOP CAREER SKILLS THROUGH RESEARCH

Working directly on world-class research projects gives College of Engineering students hands-on experience and provides an opportunity to apply classroom knowledge in the real world.

Martin Eichers, a mechanical engineering major, took advantage of a research opportunity developing a new bio-based 3D printing filament to enhance his NDSU experience.

"The most important thing I obtained from my research is the real-world experience and engineering application," Eichers said. "Employers often look for students with applied experiences and working as a researcher provided an overall background I need to begin my engineering career."

The research experience also helped Eichers get a summer internship as a mechanical and materials test engineer, which will further strengthen his knowledge and skills.

ALUMNI NEWS

FACULTY MEMBER APPOINTED TO VETTEL FAMILY FELLOWSHIP

Lokesh Narayanan, assistant professor of industrial and manufacturing engineering, has been appointed to a newly established fellowship in the NDSU College of Engineering, the Vettel Family Fellowship.

Matt Vettel and his wife, Jenna, established the fellowship to support a faculty member in the Department of Industrial and Manufacturing Engineering.

Narayanan joined NDSU in 2019 after earning his doctorate from North Carolina State University. His research focuses on making human organ manufacturing using a patient's own cells possible on an industrial scale.

"This work has the potential to change the way we look at health care," Narayanan said. "And the money provided by Matt and Jenna will help kickstart my program by providing funding for students, supplies and equipment."

Narayanan will include undergraduate and graduate students on his research team, providing them valuable hands-on experience. He's also planning workshops for area high school students interested in learning more about the fast-growing field of biomedical engineering.

"I understand the impact a fellowship has on the ability to attract quality faculty to the institution. It is so important in making sure the students' educational experience is as exciting and rewarding as when I was on campus," said Vettel, a 1990 NDSU industrial engineering graduate. "It all starts with the faculty."

Vettel credits his professors at NDSU for providing the education and career advice to find excellent opportunities as an engineering graduate. The mentorship eventually led Vettel to Harvard Business School where he earned his Master of Business Administration.

Benefactors who establish faculty fellowships provide a minimum of $30,000 in annual funding for at least five years. The Vettel Family Fellowship was the first fellowship announced as part of "In Our Hands," a $400 million comprehensive campaign to support NDSU students.

FIND OUT HOW YOU CAN GIVE BACK TO THE COLLEGE OF ENGINEERING: NDSU.EDU/COE/ALUMNI

ENGINEERING EDUCATION BUILDS CAREER CONFIDENCE

Lauren Singelmann credits her self-confidence to the opportunities she's been given at NDSU to learn and grow in her field of engineering.

"Imposter syndrome is something I continue to work through, but I've found that I now have more moments where I genuinely feel proud of myself and my work," Singelmann said. "When working on a thesis or dissertation, you become the expert on that topic. It has required me to grow in my ability to tackle tough problems and feel more comfortable standing up for my decisions."

Singelmann earned her bachelor's and master's degrees from NDSU and started working toward her doctoral degree this fall. Singelmann also works as NDSU's outreach coordinator for the College of Engineering.

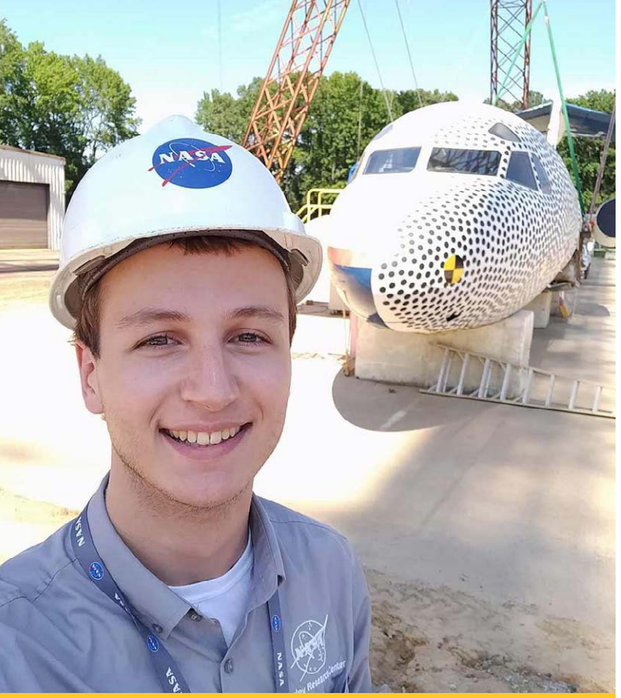
As an outreach coordinator, Singelmann organizes and hosts programs for students in elementary school through high school. She does not expect all of these students to become engineers, but her hope is that students feel more confident going into their math and science courses.

"Knowledge in engineering helps you grow in your problem-solving and technical skills, and those abilities are valuable in almost anything you do today," Singlemann said.

Engineering is more than designing and building bridges, tunnels, vehicles and structures. Singlemann says engineers can find jobs in just about any industry because of the broad range of skills learned. NDSU realizes this versatility and has many resources, pathways and connections available for students.

Singelmann wasn't always sure she wanted to pursue a graduate degree. But she realized after discussions with her adviser that helping to better educate and support students was her career passion. Her love of learning, engineering and helping others made the decision to pursue an advanced degree an easy one. Singelmann is now able to work on complex technical problems and teach the next generation of students.

"If you're considering continuing your education, I'd really encourage you to jump in and go for it. For me, it's been challenging and scary, but even more empowering and rewarding," Singlemann said. "Graduate school has definitely prepared me for the type of career I want to pursue in the future. NDSU has given me so many opportunities during my time here so far, and I've already been able to make an impact both locally and globally."



OUT-OF-THIS-WORLD INTERNSHIP

Mechanical engineering student Andrew Fristed earned an internship at the NASA Langley Research Center in Hampton, Virginia.

His specific job was to develop a sorting program that automatically links aircraft fastener part numbers with parameters specified by the user. The program was needed to verify fastener Computer Aided Design files used at the center.

"This internship showed me what it's like to be a part of a real engineering organization, and not just any organization – NASA tackles the hardest problems we know," said Fristed, who may go on to graduate school and plans a career in aeronautics or astronautics. "Seeing what it takes to succeed and thinking that it's in the realm of possibility for me to achieve inspired me even more to pursue difficult tasks."

Academic adviser Jordi Estevadeordal, associate professor of mechanical engineering, said Fristed's NDSU education helped build a foundation for his successful internship.

"Andrew was highly motivated to pursue the NASA internship and his drive paid off," Estevadeordal said. "He used much of the learnings from school, put them to practice and gained further experience in the real world."

COLLEGE HAPPENINGS

COLLEGE OF ENGINEERING ADDS NEW PROGRAMS

The College of Engineering offered students two new programs this fall.

The new Bachelor of Science degree in environmental engineering is the first in the state of North Dakota and will concentrate on environmental protection, improvement and sustainability as well as protection of human health.

It also has the potential to enhance diversity in the college by attracting more women. Nationally, half of all B.S. environmental engineering degrees are conferred to women, the highest of any engineering discipline.

The college also has added a minor in robotics available to all students in the college.

The program is designed to offer extensive hands-on learning activities that directly relate to real-life applications.

TOY ADAPTATHON HELD AT NDSU

NDSU's Disability Services, the Department of Electrical and Computer Engineering and Eta Kappa Nu Honor Society partnered to make the holiday season more enjoyable for children of all abilities.

Playing with off-the-shelf toys is often not possible for children with physical and motor disabilities, depending on their unique abilities. However, toys can be modified so the original switches are rerouted to a larger switch that is more accessible and easy to operate.

Students helped adapt dozens of donated toys that were then distributed around the community.

COLLEGE OF ENGINEERING LAUNCHES STEM KIDS TAKE HOME PROGRAM

The NDSU College of Engineering debuted a new way for parents to get their kids excited about science, technology, engineering and mathematics, commonly known as STEM. The STEM Kids Take Home program used fun, hands-on learning activities to stimulate children's minds and pique their interest in topics not usually covered in their regular school classes.

Based on the popular STEM Kids Camp program, STEM Kids Take Home featured nine kits covering areas such as electrical engineering, anatomy, physics, coding and crime scene science.

"We are disappointed that we weren't able to have STEM Kids as normal this year (due to the coronavirus), but excited to be able to offer this new option," said Lauren Singelmann, outreach coordinator for the college.

In July, the college shipped hundreds of kits to families all around the country.

STUDENT RESEARCH TEAM SHINES IN NASA COMPETITION

An NDSU student research team has been selected as one of seven national winners in the 2021 Moon to Mars eXploration Systems and Habitation Academic Innovation Challenge.

The competition, sponsored by NASA in partnership with the National Space Grant Foundation, is for projects to assist the Artemis missions for NASA's Moon to Mars explorations. NDSU's "Pathfinder Project" was awarded $34,000.

NDSU student team members include Kimberly Whaley, a senior and graduate student in mechanical engineering; John Langaas, a senior majoring in mechanical engineering; and Alex Hubbard, a senior majoring in computer engineering. They were assisted by mechanical engineering faculty members Jessica Vold, Ali Amiri and Bora Suzen in writing the grant proposal.

The team has designed a preliminary concept for a remotely controlled solar-powered robot that can prepare flat, compacted areas on the lunar surface. The robot will have two primary functions, bulldozing and compacting, which will enable the building of structures and roads on the lunar surface. The team's goal is to lay the foundation for future civil engineering projects on the moon while also helping NASA create a sustained human presence on the lunar surface.

FACULTY AWARDS

BEZBARUAH RECEIVES FULBRIGHT AWARD

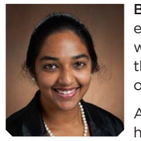
Achintya Bezbaruah, associate professor of civil and environmental engineering, has been awarded a prestigious Fulbright U.S. Scholar Program. Bezbaruah will work on nano-enabled technology development to manage membrane fouling in drinking water reverse osmosis units.

NAWARATHNA RECEIVES CAREER AWARD

Dharmakeerthi Nawarathna, associate professor of electrical and computer engineering, has received a National Science Foundation CAREER Award, considered the agency's most prestigious award in support of early-career faculty.

Nawarathna's research focuses on developing a low-cost, highly sensitive sensor that can detect the early stages of cancers and other diseases.

AJMERA HONORED BY ENGINEERING SOCIETY



Beena Ajmera, assistant professor of civil and environmental engineering, has been recognized with the 2020 Thomas A. Middlebrooks Award and the 2020 Collingwood Prize by the American Society of Civil Engineers.

Ajmera is the first woman and sixth person in history to receive both the Middlebrooks Award and the Collingwood Prize.

STRAUB NAMED CHALLEY INSTITUTE FACULTY FELLOW

Jeremy Straub, assistant professor of computer science, was named to the inaugural class of Sheila and Robert Challey Institute for Global Innovation and Growth Faculty Fellows.

The institute is dedicated to enhancing economic growth and opportunity.

KATTI AWARDED 2020 FACULTY LECTURESHIP

Dinesh Katti, Jordan A. Engberg Presidential Professor and professor of civil engineering, was selected to give the 59th Faculty Lectureship, one of NDSU's oldest and most prestigious awards. The honor recognizes sustained professional excellence in teaching, scholarly achievement and service.

PROMOTIONS

PROMOTED TO FULL PROFESSOR:

- **Shafiqur Rahman,** agricultural and biosystems engineering
- **Gursimran Walia,** computer science
- **Xiangfa Wu,** mechanical engineering

PROMOTED TO ASSOCIATE PROFESSOR

- **Dharmakeerthi Nawarathna,** electrical and computer engineering

AWARDED TENURE:

- **Jordi Estevadeordal,** associate professor of mechanical engineering
- **Dharmakeerthi Nawarathna,** electrical and computer engineering

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