



# utah

ENGINEERING



**ECE PROGRAM LAUNCHES IN KOREA**

*Photo taken pre-pandemic*



# ECE PROGRAM IN KOREA



On February 22, the University of Utah's College of Engineering launched an undergraduate curriculum at the U's Asia Campus (UAC) in Incheon, South Korea, in a move that will broaden the college's global reach and strengthen the caliber of its students. UAC students will now have access to baccalaureate programs in electrical engineering and computer engineering.

These four-year undergraduate programs will have the same comprehensive and rigorous courses as their Utah counterparts, including classes in Electromagnetics & Transmission Lines, Embedded Systems, Engineering Probability & Statistics, and Digital System Design. Electrical and Computer Engineering Department chair Florian Solzbacher says this will be the start of a growing curricular offering in ECE at the U's Asia Campus.

"It will begin with two professors in South Korea working with one of our Salt Lake City-based tenure-track faculty members," he said. "We ultimately want to encourage research at the Asia Campus as well."

The goal is to have 50 students enrolled in each of the electrical engineering and computer engineering tracks. Students will spend the first two years at the Asia campus and then complete their junior and senior years in Utah. "Once students come to Utah, we hope they will be inspired to move forward with a master's or Ph.D. degree," Solzbacher said. "These are highly structured courses of study," Randy McCrillis, the U's

Office for Global Engagement Executive director, said of the engineering curricula. "Opening these degrees [at the Asia Campus] offers the ability for [U of U] students who couldn't go abroad before to go and to stay on plan."

The University of Utah Asia Campus was launched in 2014 and offers undergraduate programs in communication, psychology, film and media arts, and urban ecology. It also has master's programs in public health and biomedical informatics.

Electrical and Computer Engineering is the second department from the College of Engineering to offer degree options at UAC. In 2019, the U's Department of Civil and Environmental Engineering unveiled its undergraduate program at the Asia campus with the same courses taught in Utah. The core civil and environmental engineering curriculum at the Asia Campus, like the one in Salt Lake City, includes classes in engineering calculus, transportation, engineering economics, strength of materials, dynamics, general chemistry and more.

"The opportunity for academic and global exchange will enrich the educational and cultural experience of both student bodies," said U civil and environmental engineering chair Michael Barber. "In the future, I would hope that more U.S. students will take advantage and come to the UAC to learn with our Korean students. I believe this educational, technical and cultural exchange will strengthen the program on both campuses."

# COMPUTING PROFESSOR RECEIVES SLOAN FELLOWSHIP

University of Utah School of Computing assistant professor Tucker Hermans has received the prestigious 2021 Sloan Research Fellowship, given to researchers “whose creativity, innovation, and research accomplishments make them stand out as the next generation of scientific leaders.”

The awards are open to scholars in eight scientific and technical fields from chemistry and Earth system science to computer science. Winners receive a two-year, \$75,000 fellowship.

“I look up to everyone I know in my field who has received this award, and I couldn’t believe I was being recognized at the same level as them,” Hermans said. “I am really honored to receive this distinction.”

Hermans earned a doctorate in robotics and a master’s in computer science, both from the Georgia Institute of Technology. He was a postdoctoral researcher in robot learning at Technische Universität Darmstadt in Germany and later a senior research scientist for NVIDIA in Seattle. He joined the U in 2015 as an assistant professor in the School of Computing. He received the National Science Foundation’s CAREER Award in 2019 and is an IEEE Senior Member.

His research is focused on autonomous learning, planning, and perception for robot manipulation, and he is working on enabling robots to autonomously discover and manipulate objects. He is the director of the Utah Learning Lab for Manipulation Autonomy at the U.



# NSF VETERAN NAMED SCI INSTITUTE DIRECTOR

National Science Foundation and Office of Science and Technology veteran, Manish Parashar, became the new director of the University of Utah’s Scientific Computing and Imaging (SCI) Institute on Jan. 1, 2021. SCI is a campus research center where over 185 faculty, staff, and students — most from the U’s College of Engineering – work together to shape the future of scientific computing and imaging.



“SCI has established itself as a pioneer and an international leader in computational and data-enabled science and engineering research and education,” said Parashar, who was a Distinguished Professor of computer science at Rutgers University before coming to the U. “SCI is well poised to take on a leadership role in this scientific revolution.”

Parashar earned both master’s and doctorate degrees in computer engineering from Syracuse University. He is the founding director of the Rutgers Discovery Informatics Institute and served as associate vice president of that university’s Office of Advanced Research Computing. He was also co-director of the Cloud & Autonomic Computing Center and associate director of the Center for Information Assurance.

He is currently on loan to the National Science Foundation as director of its Office of Advanced Cyberinfrastructure, and he leads the foundation’s strategic vision for a National Cyberinfrastructure Ecosystem for 21st Century Science and Engineering. He served as assistant director for Strategic Computing at the White House Office of Science and Technology Policy where he led the development of the national strategic plan for the Future Advanced Computing Ecosystem.



# POWERING UP

Jake Tuttle was watching closely while the Texas power outages blanketed the state earlier this year and left more than four million homes and businesses without electricity.

For the University of Utah chemical engineering graduate, the tale of freezing temperatures that knocked out power stations, natural gas pipelines and wind turbines in the Lone Star State underscored the importance of communities having multiple sources of electricity.

"A properly constructed grid is diverse. It has coal, nuclear, wind, solar, natural gas, hydro," he said. "These generating sources have to be optimized to be as clean and efficient as they can so they can be more prepared for events like Texas. That diversity is where everyone comes out a winner."

That's why Tuttle, who received his doctorate degree in chemical engineering last year, devoted nearly three years of his post-doctoral research figuring out how to improve operating efficiency at the Huntington coal-fired station in central Utah. His work led to some surprising results.

The project involved performing an in-depth analysis of the plant's operations and then using software with sophisticated artificial intelligence to fine-tune control setpoints so the coal-fired station could run more effectively and with lower emissions. A multi-year analysis of system performance had never been done before.

It began with studying how the coal-fired unit's operation changed in response to an evolving electrical grid and changing economic policies. He compared the emission rates - particularly nitrogen oxides (NOx) - plant operating efficiency, and equipment health for two and a half years before and after a major market shift.

"With that as a backdrop, we worked with the software and optimization system to better control the combustion process to reduce emissions," Tuttle said.

Using a software toolkit from Griffin Open Systems that works on top of the power plant's control system, Tuttle made control adjustments based on his study so the Huntington plant could produce more energy with less fuel while emitting less NOx into the atmosphere.

"At the end of our long-term analysis, our NOx emission rates were about 20% lower on average across the unit's load range," he said. "We also reduced the occurrence of high temperature steam situations by 80%. We were able to achieve a substantial improvement with just software. The plant was pleased to see those kinds of improvements that required only a minimal investment."

PacifiCorp, the company that owns and operates the Huntington plant, was so impressed that Tuttle and others are developing a similar advanced control system at a coal-fired plant near Castle Dale, Utah. "Then there's the potential to go fleetwide," he said.

Tuttle has been around engineers his whole life and understands their value to a local community. His father and uncle are civil engineers who run their own engineering firm in Southeastern Utah. Since the seventh grade, he helped his father every summer setting elevations, pounding elevation stakes, and laying pipelines.

When he started college, Tuttle first studied biomedical engineering but later realized he didn't want to work in a hospital. Ultimately, he switched to chemical engineering with the encouragement of his friends. After receiving his Ph.D., Tuttle was hired by Griffin Open Systems as a research, development and application engineer. He manages projects for coal power plants across the western U.S. and develops similar optimization systems for other industrial processes internationally.

"The U has helped tremendously in getting me to where I'm at today," he said. "It really set me up to go and do this work."

And his research ultimately could help cities and states around the country that face potential power plant shutdowns from a natural disaster.

"There are a lot of factors to take into account in the Texas event," he said. "But in that moment, could artificial intelligence solve some of those things? It's possible that properly developed AI systems tuned to monitor grid stability could help manage the grid itself and aid in avoiding some of the major failures which occurred."





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# IN MEMORIAM ROBERT G. ENGMAN



The College of Engineering mourns the passing of Robert G. Engman (BSEE '53) in Rancho Santa Fe, Calif., on January 18. Engman, aged 90, was a lifelong friend and benefactor to the College of Engineering and a Distinguished Alumnus of the University of Utah. A successful businessman, Engman is best known as the founder of OPTO 22, a company based in Temecula, Calif., that enabled industrial automation with a line of optically isolated solid-state relays and digital controllers. OPTO 22's product line of I/O modules quickly became a standard throughout the world and formed the backbone of industrial control.

Born in Draper, Utah, Engman never forgot his roots. Beginning in 1973, he and his wife have donated more than \$2.6 million in scholarships, capital gifts, computers and equipment to the University of Utah. Hundreds of students have benefitted from the Engman Scholarship Endowment, and countless more have completed assignments in the Engman Computer Lab in the Warnock Engineering Building.

Engman is survived by his wife Mary Jane, who served as chief financial officer for Opto 22, and their three children.

## CENTER FOR INCLUSIVE COMPUTING

Recognizing the importance of inclusion in engineering and in computing, the University of Utah's College of Engineering will be launching the Utah Center for Inclusive Computing (UCIC) in an effort to boost the percentage of students from groups currently underrepresented in computing.

The focus of the center will be to develop and implement programs that create a welcoming atmosphere for computing as a discipline and encourage more students from underrepresented groups to pursue computing-related undergraduate degrees.

"Given how important computing is to job growth in Utah, it is critical that the computing workforce be representative of the people of the state," said University of Utah School of Computing Director Mary Hall, who will head the center.

While the percentage of female undergraduates in computing has tripled in the U's College of Engineering over the last decade, the ratio of female to male students continues to be a concern. And Utah ranks among one of the lowest states in the U.S. in female participation in the STEM workforce. Also, students identifying as Latinx make up 14% of the students at the U but only 9% of the undergraduate majors in the U's School of Computing.

To increase the percentage of students from groups that have been historically underrepresented in computing, the center will focus on three pressing needs: Better preparation of high school students in math and computer science before they enter college; boost recruiting efforts in first-year computing classes; and retain these students in their computing curriculum all through graduation. UCIC will partner with community leaders who will help guide the activities of the center and develop new programs to meet the needs of all involved.

The center will initially be funded through a two-year \$700,000 grant from the Northeastern University Center for Inclusive Computing, renewable for a third year for a total of \$1 million.





# ALUMNA SPOTLIGHT

## SHEILA HARPER, Ph.D.

Looking back on her education, Sheila Harper (Ph.D. MSE '06), describes herself as a "highly non-traditional student." Her 20-year academic journey was disrupted by marriage, geography, and family life. Ultimately, she achieved success and recognition as a rocket scientist, with an impressive list of publications and presentations. Harper views her unconventional path as an advantage because, "It gave me insights into what I really wanted to do with my life."

Harper grew up in the Baltimore area. An only child, she was influenced by her father who was an electronics engineer and her mother, a life-long educator. While dad encouraged her studies in the sciences, Harper's mother insisted that she take courses in typing and shorthand for non-business majors, as well as technical writing. These skills, Harper said, gave her a decided advantage in her life as an engineer.

Harper completed a bachelor's degree in chemistry at Purdue University. Following graduation in 1977, she accepted a position as a chemist in propellant development at Thiokol Corporation. She gained her first experience in the characterization of polymeric composite materials while at Thiokol and expanded that experience as a materials specialist in Manufacturing Engineering at Hercules.

While balancing marriage, two children, and an intensely technical job, Harper also found time to pursue a Ph.D. in materials science and engineering at the University of Utah. She said, "The university changed my life and my family's life. After living in a small town and working in a remote location, the university opened the world to us."

At the U, Harper also discovered her love of teaching as a graduate teaching assistant, course instructor and guest lecturer from 1988 to 1997.

In 1997, Harper returned to Thiokol (now Northrop Grumman) as a senior scientist and materials specialist in adhesives for solid rocket motor nozzle applications. In this role, she developed a pre-ceramic adhesive for installation of instrumentation in the bore of solid rocket motors, among other accomplishments.

Over time, Harper progressed from senior scientist to principal investigator/team lead, working closely with the Air Force on such projects as developing and characterizing high-temperature-capable composite materials systems for rocket motor applications, and performing fundamental research in interfacial science for the Navy.



"My chemistry background taught me how to assemble molecules, while my engineering showed me how to make those molecules into materials with practical application," she recalls. As team lead, Harper provided technical oversight for all composite materials and processes projects/programs in ATK's (formerly Thiokol's) Research and Development Laboratory.

"After investing so many years into my Ph.D., I made a conscious decision to stay on the technical side of the company rather than opting for administration. It was the technical challenges that kept me excited."

Harper spent the next phase of her career as an R&D analyst for Janicki Industries, a relatively small company with large research and development capabilities for their product-line of tooling for making composite structures.

Harper remains active in the profession as Vice Chair of the Utah Chapter of ASM International, a society for the advancement of materials science and engineering. She enjoys spending time with her sons and grandsons and hiking with husband, Mike, who was also an engineer (now retired). Harper gets emotional describing their 40-plus-year marriage. "I could never have achieved all that I have without Mike's enduring love and support."

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# STUDENT LIFE

## FIRST CERTIFICATE GRADUATES

The University of Utah's College of Engineering recognizes that commercializing research is an integral part of an engineer's success. That's why in 2017 the college along with the U's David Eccles School of Business created the Engineering Entrepreneurship Certificate (EEC), a unique hybrid of engineering, business, entrepreneurship, innovation and law courses for undergraduate and graduate engineering students.

The first cohort of students has completed the curriculum, and the reviews are in - the EEC program provides invaluable lessons that prepare engineering students to enter the business world.

"I have always had an interest in business, and the entrepreneurship certification was a great way for me to learn about entrepreneurship and business," said Sid Agrawal, one of the first students to earn the certificate as a newly minted Ph.D. graduate in chemical engineering.

Agrawal found the staff helpful and friendly and said one strength of the program is a curriculum and course structure that isn't restricted to lectures and slideshows.

"While I enjoyed all my classes, I thoroughly enjoyed Patent Law because of the Socratic method. The class really showed me how much patents matter and how to protect an idea," he said.

Sophia Gardner, a materials science and engineering senior, also learned important lessons on how engineers can work with business partners to successfully commercialize research.

"The Engineering Entrepreneurship program has given me the knowledge to work at the intersection of business and STEM, bringing research and innovation to market where



Photo taken pre-pandemic

they can have a tangible impact," she said. "I am very grateful for my experience in the program. I recommend it to anyone interested in technology commercialization."

Kyle Isaacson, who earned a doctorate degree in biomedical engineering, applied for the EEC program to stand out from other engineering graduates.

"Despite going for a Ph.D., I'd always known that I was headed for an industry career and not an academic one. I figured this designation would set me apart," said Isaacson, the first student to graduate from the program.

Currently, Isaacson is running a freelance scientific consulting firm called Ike Scientific, and he credits the certificate courses for giving him the expertise he needs, stating, "the EEC program has definitely helped." While Isaacson said the company is still a one-man show, it has been very successful, and he was honored as one of *Utah Business* magazine's "20 in Their 20s" for 2019.