SUMMER 2022 — KANSAS STATE UNIVERSITY

ECE UPLINK

MIKE WIEGERS DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

ECE UPLINK

Summer 2022

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KANSAS STATE UNIVERSITY

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Above: *A biomedical engineering student works in the new Tong Family Biomedical Education and Innovation Laboratory*
On the cover: *Students from Wildcat Wind Power work in the Alan and Jan Levin Student Design Team Suite*

Contents

From the Department Head

I am happy to present the summer 2022 edition of Uplink, the Mike Wiegers Department of Electrical and Computer Engineering's annual magazine! It has been an interesting year as we continue to adjust to our new normal of higher education in a pandemic environment. We returned to full in-person teaching for all of our classes while also recording many lectures due to student absences. Although we continued to see a slight decline in our enrollment, we are also very encouraged by the positive indicators for the size of our incoming freshman class this fall. While we've had many highlights this past year, three of the largest are 1) our Wildcat Wind Power team took first place at its national competition; 2) our first biomedical engineering class graduated this spring; and 3) the dedication of the Tong Family Biomedical Education and Innovation Laboratory.

In addition to our wind power team accomplishments, our robotics student group had two teams qualify and compete in national competitions. Graduating senior Ceci Schmitz was awarded a Graduate Research Fellowship from the National Science Foundation and we had numerous awardees at our spring departmental banquet. Our end-of-semester Senior Design Expos continue to be a great success. We are very proud of all of our students, as they do great things here and are in high demand for positions after they graduate.

Our faculty and staff are also extremely successful and well recognized. Hongyu Wu received an NSF CAREER award, and Caterina Scoglio received the prestigious Distinguished Graduate Faculty Award at K-State. Austin Pfannenstiel received the Excellence in Innovation and Economic Engagement Award, and Jungkwun Kim was awarded tenure and promotion to associate professor. Our research expenditures hit an all-time high of $4.2 million for this past year, which is outstanding. There are many research activities taking place in the department, including a significant one that was just announced: the $24 million NSF statewide project, "Adaptive and Resilient Infrastructures Driven by Social Equity," that is being led by Bala Natarajan with co-PI Anil Pahwa.

Finally, it was great to be able to recognize several ECE alumni during the 2022 Seaton Society Award Celebration. Michelle Munson was inducted into the Carl R. Ice College of Engineering Hall of Fame, while Vinit Gupta and Silpan Patel were recognized as Professional Progress Award recipients. I would also like to thank all of our alumni who have been extremely generous with their support this past year.

We would love to hear of our alumni accomplishments, so please let us know your recent news by sending a quick note to **alumninews@ece.k-state.edu**. As always, please feel free to stop by the department the next time you are in Manhattan.

Go Cats!

Don M. Gruenbacher
Department Head
George J. and Alice D. Fiedler Distinguished Chair in Electrical and Computer Engineering

Schmitz awarded NSF Graduate Research Fellowship

Ceci Schmitz, spring 2022 graduate in electrical engineering, was selected for the National Science Foundation's Graduate Research Fellowship. The Topeka native will attend Duke University in the fall to pursue her doctorate in biomedical engineering.

The NSF Graduate Research Fellowship recognizes outstanding students who are pursuing research-based master's and doctoral degrees in the sciences, technology, engineering or mathematics. Fellowship recipients receive three years of funding, including a $34,000 annual stipend and a $12,000 payment to the university in lieu of tuition and fees.

"The opportunity to advance technology for interfacing with the human nervous system is of interest to me because of the revolutionary impact for individuals with neurological damage and disorders."

– Ceci Schmitz

At Duke, Schmitz will work in the lab of researcher Jonathan Viventi, who is developing novel, implantable flexible electrode arrays for monitoring brain activity in patients with epilepsy.

"The opportunity to advance technology for interfacing with the human nervous system is of interest to me because of the revolutionary impact for individuals with neurological damage and disorders," Schmitz said.

Her doctoral research will follow up on work Schmitz has been doing at K-State's Brain and Body Sensing Laboratory, run by David Thompson, who holds the Mark and Brenda Brown professorship in electrical and computer engineering and is an associate professor of electrical and computer engineering.

Her work in the lab included a project testing algorithm accuracy data of a speller driven by a brain-computer interface, which is an assistive technology tool that helps people with severe impairments communicate. For another project, Schmitz analyzed the effects of word priming on emotion classification using electroencephalogram data.

Schmitz also worked virtually with Joshua Smith at the Sensor Systems Laboratory at the University of Washington last summer for a Research Experience for Undergraduates program. She researched optimization of wireless power transmission to wearable sensors for recording neural activity using a radio frequency power transmission antenna and an electromyography sensor.

Along with her research work, Schmitz has been active in several K-State student organizations, serving as outreach chair for the Engineering Ambassadors, engineering world health chair for Engineering in Medicine and Biology Society and electrical/biomedical chair for the Prosthetics Design Team. She also has been involved in Steel Ring, Alpha Phi Omega and Tau Beta Pi engineering honor society. A K-State semester honors list student for seven semesters, she is an Engineering Leadership and Innovation scholar and received the Tau Beta Pi Scholarship and Putnam Scholarship. She also was named Outstanding Junior in Biomedical Engineering and graduated summa cum laude.

Wildcat Wind Power
notches first-ever win

Kansas State University's Wildcat Wind Power team won for the first time in club history at the 2022 Collegiate Wind Competition, a U.S. Department of Energy event in San Antonio May 16-18.

The K-State team battled 11 other schools to claim the top prize in the yearlong national competition. The team designed, built and tested its model wind turbines throughout the academic year before presenting and testing the models in a wind tunnel at the event, which was in conjunction with the American Clean Power Association's CLEANPOWER 2022 conference and exhibition.

Hongyu Wu, faculty advisor for Wildcat Wind Power, was pleased to see the team's hard work pay off.

"I am so proud of our team's effort in this competition," Wu said. "The chief judge was very complimentary of the team's performance, saying the turbine testing performance was the best he had seen since the inception of the DOE Collegiate Wind Competition."

The competition is divided into four contests that test the skills of the team on its ability to create a viable model, along with rating the team's design and presentation skills, its ability to design an offshore wind farm and its effectiveness in wind-related outreach.

K-State placed in the top half of each contest, winning in turbine testing, taking second in turbine prototype, fourth in connection creation and fifth in project development to finish with the highest overall score.

"We developed the turbine early in the fall semester and continued design and testing right up until we left for San Antonio," said Hayden Dillavou, vice president of the club. "We have our own wind tunnel and workspace in the basement of the engineering building, where we do most of our testing and design work."

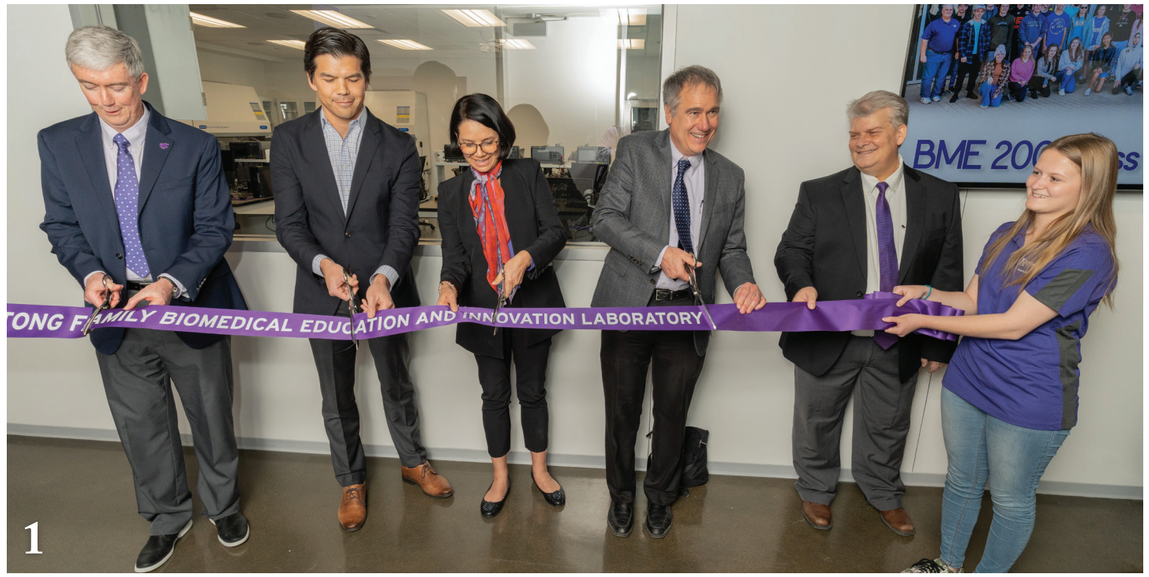
Dillavou said the club is made up primarily of mechanical and electrical engineering students but welcomes members from all majors and backgrounds, including those outside the Carl R. Ice College of Engineering.

View the list of all students who are members of Wildcat Wind Power and their hometowns by going to **engg.us/wwp2022**.

Members of the Wildcat Wind Power team at the 2022 Collegiate Wind Competition pose with their awards after taking first place overall. From left: Israel Barraza, Michael Brosseit, David Pierson, Jakob Long, Hayden Dillavou, Andrew Dulac, Kavian Kalantari, faculty advisor Hongyu Wu, Brianna Wagoner, Matthew Monsion, Eric Christman and Josh Meurer.

New biomedical lab dedicated to Tong family

On March 25, 2022, the college took the opportunity to formally unveil and dedicate the Tong Family Biomedical Education and Innovation Laboratory, a space that will support biomedical engineering students and faculty for many years to come. Joined by students, faculty and members of the Tong family to celebrate, the department is thankful for their support and their continued generosity to make this space possible.



1

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About the photos

1. Dean Matt O'Keefe, David Tong, Sarah Sangmeister, Department Head Don Gruenbacher, Professor Steve Warren and biomedical engineering student Kelsey Warren cut the ribbon.

2. David Tong and Sarah Sangmeister represent the Tong family. Peter and Janet Tong were unable to attend the event.

3. Sarah Sangmeister meets biomedical engineering students during the reception.

4. Professor Steve Warren gives a tour of the Tong Family Biomedical Education and Innovation Laboratory to David Tong.

5. Biomedical engineering students celebrate the dedication of the new Tong Family Biomedical Education and Innovation Laboratory.


3


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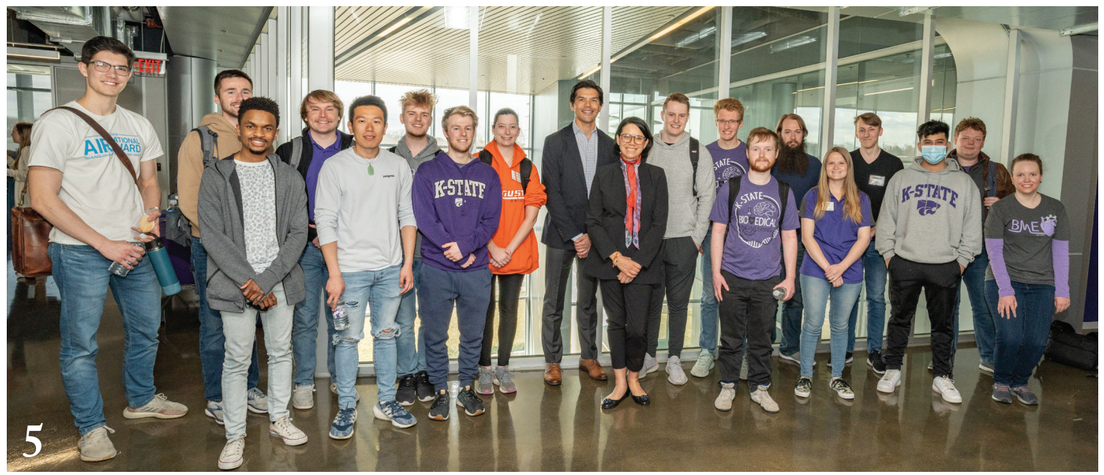

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ECE RESEARCH

Resilient, socially equitable infrastructure

Ensuring that infrastructure is equipped to support all communities after a disaster, including historically underserved groups that often receive less aid in the aftermath, is the aim of a new five-year, $24 million statewide initiative funded by the National Science Foundation.

Kansas State University joins a collaborative group of 16 other universities and colleges in Kansas, along with industry leaders and disaster experts, for the project, which is designed to better equip communities with limited resources before and after a natural disaster strikes. The project is titled "Adaptive and Resilient Infrastructures Driven by Social Equity."

Bala Natarajan, Steve Hsu Keystone research scholar and Clair N. Palmer and Sara M. Palmer electrical engineering professor in the Mike Wiegers Department of Electrical and Computer Engineering, will lead K-State's portion of the project.

"I find that the most challenging societal problems typically require solutions that cut across disciplinary boundaries," Natarajan said. "That is why I am excited to work on this unique project, as it will bring together a diverse team of researchers from across Kansas to help create a paradigm shift in resilience science and engineering."

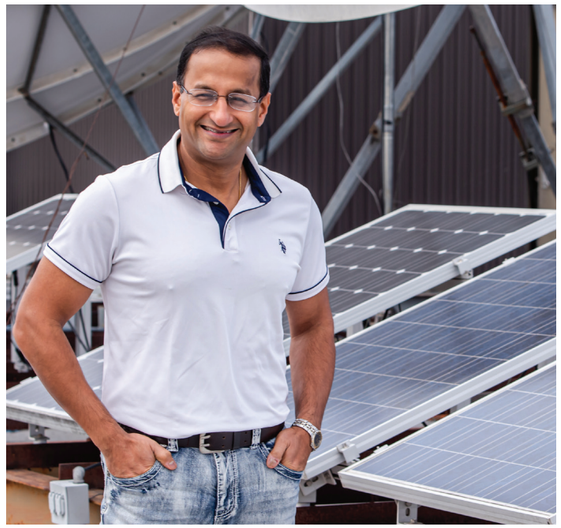
Funded through the NSF's Established Program to Stimulate Competitive Research RII Track-1 program, the project's overall goal is to determine how infrastructure resilience intersects with social equity and how human capacity, physical infrastructure and policy levers can be designed to achieve socially equitable outcomes that collectively improve decisions and community resilience. The NSF will provide $20 million, with the state of Kansas adding $4 million in matching funds.

"I find that the most challenging societal problems typically require solutions that cut across disciplinary boundaries."

– Bala Natarajan

Belinda Sturm at the University of Kansas will serve as principal investigator on the project, leading the group of 23 researchers from Kansas State University, the University of Kansas and Wichita State University. Joining Natarajan from the Carl R. Ice College of Engineering at K-State as co-principal investigators are George Amariucai and Lior Shamir, both from computer science; Husain Aziz, civil engineering; Anil Pahwa, electrical and computer engineering; and Vaishali Sharda, biological and agricultural engineering. Jason Bergtold, agricultural economics, joins from the College of Agriculture.

"The team will leverage fundamental advances and tools from social sciences, engineering and computer sciences to develop a new social equity-driven paradigm that will transform the way researchers and communities approach smart and resilient communities," Natarajan said. "Working closely with multiple stakeholders, we are looking forward to translating our theoretical modeling and analysis work into a meaningful decision support framework that Kansas communities can use in their policymaking, planning and operation of critical infrastructures."



Targeting underserved populations, the project will introduce more than 2,400 Kansas families to resilience, resulting in an understanding of individual capacity and preparedness for disasters while providing pipelines to higher education.

Power grid defense project

A robust defense of our nation's power grid is as important as ever as cyber-data attacks become more sophisticated and common. Enhancing the resiliency of cyber-physical power grids under such attacks and providing system operators the tools they need to enhance situational awareness is essential.

This is the research focus of **Hongyu Wu**, Michelle Munson-Serban Simu Keystone research scholar and associate professor in the Mike Wiegers Department of Electrical and Computer Engineering at Kansas State University, who has received a $500,000 Faculty Early Career Development, or CAREER, Award from the National Science Foundation.

His project, "CAREER: Toward attack-resilient cyber-physical smart grids: moving target defense for data integrity attack detection, identification and mitigation," aims to provide tools to power system operators while also promoting public awareness and understanding of smart grid cybersecurity, contributing to power engineering education, and preparing a diverse learning community with requisite knowledge and skillsets to tackle the security challenges of future power grids.

"This CAREER project aims to provide a theoretical foundation and design guiding principles that will unlock the full potential of moving-target-defense approaches and significantly enhance the resiliency of cyber-physical power grids under cyber-data attacks," said Wu, who also holds the Lucas-Rathbone professorship in engineering. "This project will develop novel optimization, graph theory, low-rank matrix theory and machine learning methods for optimal planning and operation of moving-target-defense devices, rapid detection, accurate identification and robust mitigation of cyber-data attacks."

"This CAREER project aims to provide a theoretical foundation and design guiding principles that will unlock the full potential of moving-target-defense approaches. . ."

– Hongyu Wu

Additionally, Wu said this project will transform existing bulk transmission system operations that rely on limited cyber-layer security mechanisms to proactive approaches using widely deployed smart devices.

Munson inducted into 2022 Hall of Fame

The Carl R. Ice College of Engineering at Kansas State University inducted three new members into its Hall of Fame on March 5.

Induction to the hall is the highest honor bestowed on its alumni by the college. Honorees are recognized for their professional success and accomplishment, involvement with and support of the College of Engineering, dedication to K-State, and professional and public service.

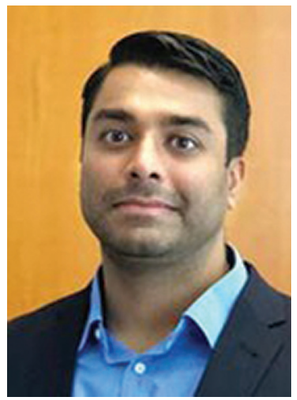
Michelle Munson, Berkeley, California, graduated in 1996 with bachelor's degrees in electrical engineering and physics. She is currently the co-founder and CEO of Eluvio, the software pioneer behind the Content Fabric, the first blockchain-based scalable content distribution network for premium video. Munson previously co-founded Aspera in 2004 and led the company as CEO until May 2017, including through acquisition by IBM in 2014. Munson holds 12 U.S. patents and is a frequent speaker in the areas of content networking, machine learning, blockchain and cloud infrastructure. She was the 2019 Kansas State University College of Arts and Sciences commencement speaker and the 2006 Alumni Fellow for the College of Engineering. She was a Goldwater Scholar for achievement in science and mathematics, and later was a Fulbright Scholar at Cambridge University, where she received a postgraduate diploma in computer science. Munson is an active runner, CrossFit member and continues her lifelong interest in dance. She and her husband, Serban Simu, have two young sons, Aidan and Kieran.

2022 Professional Progress Award

The Kansas State University Carl R. Ice College of Engineering honored 10 alumni for significant early to mid-career success at an award celebration March 5.

Recipients of the college's Professional Progress Award were nominated by their respective department heads and confirmed by Matt O'Keefe, dean of engineering.

Vinit Gupta, Novi, Michigan, is a 2002 graduate of Kansas State University with a master's degree in electrical and computer engineering. He currently holds the position of vice president, operations at ITC Holdings and is responsible for control room and system operations that support ITC's four operating companies, safety, human performance, security, emergency preparedness and response, and ITC's NERC compliance program. Before joining ITC, he worked at Entergy, a utility operating in Arkansas, Louisiana, Mississippi and Texas. At Entergy, he held various leadership roles in operations, compliance, information technology and substation maintenance, and led teams of engineers and field crews in system restoration after major storms, including Hurricane Katrina, Hurricane Rita and the 2012 Arkansas ice storm. Gupta previously served as the chair of North American Electric Reliability Corporation event analysis subcommittee, which focuses on analyzing events on bulk electric systems and publishing lessons learned.



Silpan Patel, Albuquerque, New Mexico, is a 2005 graduate of Kansas State University, dual-majoring in computer engineering and mathematics. Patel has a master's degree in electrical engineering from the University of Michigan and completed his MBA at the University of Pennsylvania's Wharton School of Business. He is the president of Ultra Labs at Ultra Electronics Group. Patel leads advanced prototype development across the group, including applied artificial intelligence research for wireless mesh networks, surveillance and reconnaissance, and mission planning. Patel has led advanced research and development efforts across government and industry in multiple technology disciplines that have been applied to missions from seabed to space. Before establishing Ultra Labs, he led multidisciplinary research and development programs at Sandia National Laboratories and MITRE Corporation.

CONGRATULATIONS
2021-2022 GRADUATES

Electrical and Computer Engineering • Class of 2021-2022


Abdulrahman Abdulkarim Sr.


Mohammed Ali


Esther Allen


Christopher Amiel


David Apple


Aseel Bakoban


Hunter Barbeau


Madeline Bermond


Yoseph Bireda


Zachary Deibert


Hayden Dillavou


Rope Dorman


Shi Feng


Rogelio Fernandez


Dawson Field


Patrick Flett


Robert Foeller


Holden Giefer


Stephanie Krass


Trevin Lanker


Benjamin MacDonald


Giancarlo Macias


Joseph Massey


Samuel McGowan


Nolan Meyer


Pierce Mitts


Matthew Monsion


Grant Nichol


Richard Pappert


Elliot Peters


Ignatius Peters


Mason Phelps


Jacob Rico-Martinez


Cody Robertson


Jhonatan Rodriguez


Michael Rubin


Ryan Sherman


Matthew Sinclair


Joshua Todd


Brandon Trieu

Nathan Vontz

Corbin Wheeler

Ryan Wolters

Andrew Yi

Ryan Younger

Grant Boehringer

William Brown

Hannah Chorn

Caden Churchman

Aurora Gray

Luke Hetrick

Luke Ikerd

Tristan Kohl

Brett Montgomery

Valeria Morinigo

Cody Morse

Sebastian Neal

Cecilia Schmitz

Tyler Schooley

Matthew Schweder

Jack Seiler

Cesar Zavala

Jiahui Zhao

Inaugural Class

Biomedical Engineering • Class of 2022

Madeline Alexander

Tegan Brandt

Sophia Braynock

Thomas Colling

Madison Droppelmann

Bradie Frizzell

Jesus Gonzalez-Morales

Megan Kinnane

Austin Luginbill

Johnathon Moses

Austin Reed

Cody Robertson

Zachary Smith

Aaron Story

Carter Tews

Kelsey Warren

Justin Yenne

Student awards

Undergraduate Student Awards

Outstanding Senior Awards

Outstanding Leadership – Hayden Dillavou
Outstanding Research – Tegan Brandt
Outstanding Service – Kelsey Warren

Outstanding Seniors in Academic Achievement

Tom Colling
Ceci Schmitz
Cody Robertson
Caden Churchman
Stephanie Krass
Samuel McGowan
Hayden Dillavou
Patrick Flett
Mason Phelps
Corbin Wheeler

Outstanding Junior Awards

Junior in Biomedical Engineering – Kharli Schiffner
Junior in Computer Engineering – Bryan Hill
Junior in Electrical Engineering – Alex Howard

Outstanding Sophomore Awards

Sophomore in Biomedical Engineering – Peyton Christian
Sophomore in Computer Engineering – Aaron Sarkar
Sophomore in Electrical Engineering – Obi Oligbo

Outstanding Freshman Awards

Freshman in Biomedical Engineering – Nicole Wagoner
Freshman in Computer Engineering – Gannon Bird
Freshman in Electrical Engineering – Colby Karnei

Graduate Student Awards

Graduate Research Award for 2021–2022 – Sai Munikoti
Graduate Teaching Award for 2021–2022 – Mehmetcan Gursoy

Other Awards

W. Leroy Culbertson Steel Ring Scholarship Recipient – Braden Funk
Knights of St. Patrick for top graduating seniors – Hayden Dillavou, Aurora Gray, Ceci Schmitz, Kelsey Warren

Student news

Student Organization News

Electronics Design Club

Helped with Open House
Ran a booth during E-Week

Engineering in Medicine and Biology Society (EMBS)

Increased member participation
Added two new design teams
Attended the 2022 Design of Medical Devices Conference
Toured Boston Scientific

IEEE Industry Applications Society (IAS)

Hosted the third annual KPEC conference

Robotics Competition Team

GPS Team took 2nd place among colleges at AVC in Ohio
Combat Robots placed 1st and 2nd in the BotsKC college bracket
Both combat robot teams qualified and competed in the national competition in Pittsburgh, Pennsylvania

Solar Car Club

Sponsoring an Off-grid Solar System in Ampasimbe, Madagascar

Wildcat Rocketry

Competed in the Argonia Cup
Competed in the Spaceport American Cup in America, New Mexico
Launched four team rockets this year

Wildcat Wind Power

1st place – 2022 U.S. Department of Energy Collegiate Wind Competition in San Antonio, Texas

Open House Displays

Dave and Virginia Braun Innovation Award

2nd place – No Stone Unturned Foundation Senior Design Team, Madeline Alexander, India Barnett, Tegan Brandt, Josie Hilgers, Justin Yenne

Degree Program

2nd place – "Into the Bioverse"
3rd place – "The Electrical Strikes Back"

Design Teams and Student Organizations

2nd place – Robotics Competition Team

Faculty awards

Clair A. Mauch Steel Ring Advisor of the Year

Charles Carlson

Teaching Assistant Professor

Commerce Bank and WT Kemper Foundation Distinguished Graduate Faculty Award

Caterina Scoglio

Professor

Steve Hsu Keystone Research Scholar

Paslay Professorship in Electrical and Computer Engineering

Excellence in Innovation and Economic Engagement Award

Austin Pfannenstiel

Teaching Assistant Professor

Mortar Board Outstanding Faculty

Steve Warren

Professor

Robert and Becca Reichenberger Cornerstone Teaching Scholar

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2022 ECE Advisory Council; from left to right, Matt Spexarth, Jeff Thetge, Don Gemaehlich, Don Gruenbacher, Jesse Schriner, Matthew Clark, William Dowling, Keegan Odle, Bob Beims, Dava Warders, Dan Burk, LeAnn Miller, Wes Lindquist, Greg Deiter, Dan Croft; Not pictured: Glen Fountain, Leslie R.E. Gordon, Ben McBride, Navin Nagiah