

FRONTIERS

RESEARCH AND SCHOLARSHIP

2018

COLLEGE OF ENGINEERING



KANSAS STATE
UNIVERSITY

Welcome to Frontiers

Throughout human history, engineering has driven the advancement of civilization. During the 20th century, engineering recorded its greatest accomplishments. For example, the electric grid, automobile, airplane, television, spacecraft, laser, computer and internet represent some of the high points from a time in which engineering improved virtually every aspect of human life. Engineering accomplishments of the past have made the world smaller and more connected. This increasing interconnectedness and complexity in the 21st century has made adaptation to change a principal challenge. Fundamental issues — globalization, increasing economic interdependence, population growth and resource depletion — compound associated interdisciplinary technical problems related to human health improvements, energy utilization, infrastructure upgrades and information technology advancements. Consequently, these issues require interdisciplinary engineering-related research approaches, and hence, contemporary engineers must possess extensive knowledge that spans many domains, unprecedented expertise within a single domain, and the ability to integrate that knowledge and expertise into their respective fields.



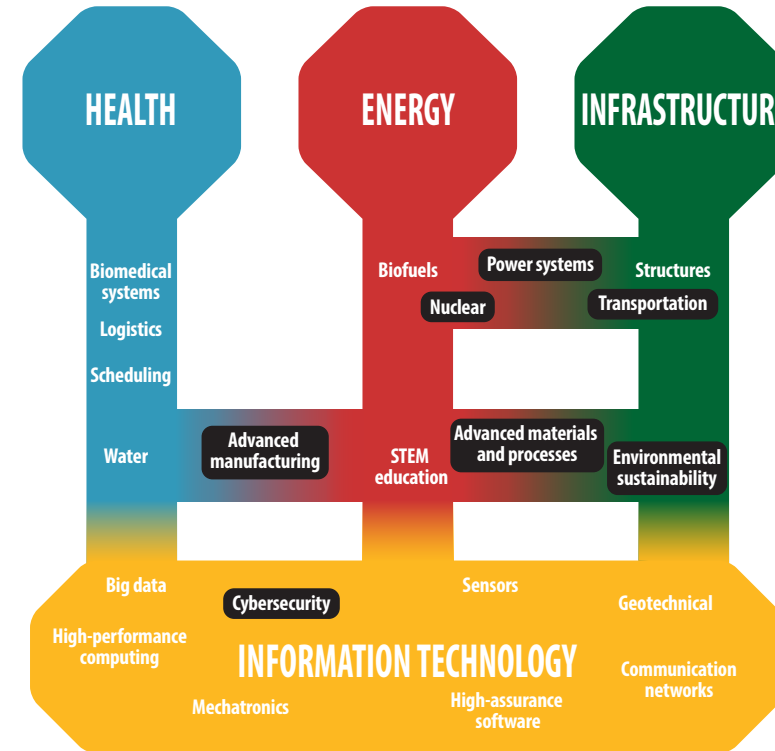
The National Academy of Engineering has articulated several grand challenges that provide guidance for engineering research programs. As such, the K-State College of Engineering has applied past successes to develop a research agenda that embraces 21st century opportunities by driving innovation-related breakthroughs in health, energy, infrastructure and information technology. Indeed, research is central to achieving the K-State College of Engineering's 2025 vision to pursue academic excellence in all of its endeavors, because research improves the quality of graduate programs and plays an important role in introducing undergraduates to exciting engineering opportunities. At K-State, it is not unusual to see faculty, graduate students and undergraduates working side by side in state-of-the-art facilities, and often with industry partners. It is with this modality that we continue ongoing research while laying the foundation and providing hands-on experiences for future engineering innovators.

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K-State's College of Engineering drives research- and innovation-related breakthroughs that change the world by investing in, promoting, and advancing research in health, energy, infrastructure, and information technology.

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FRONTIERS

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Issue No. 2, Summer 2018

Architectural Engineering and Construction Science

The GE Johnson Department of Architectural Engineering and Construction Science is nationally recognized for preparing graduates for careers in engineering and construction. The combination of these two programs in one department is unique and prepares students to work effectively as professional members of an integrated architecture-engineering-constructor team, and produce quality design and construction of the built environment.

Creative Inquiry

Architectural engineering students participate in both the ASHRAE design competition and the Architectural Engineering Institute (AEI) student design competition. ASHRAE recognizes outstanding student design projects, promotes teamwork and allows students to apply their knowledge of practical design. Since 2005, teams from K-State have been awarded first place five times and second place three times. In the history of the AEI international competition, K-State remains the only institution to have won or placed in at least one of the categories each year it has participated, taking first place in the construction category three times since 2011.

Other creative inquiry opportunities include the Illuminating Engineering Society and Structural Engineer's Association of Kansas and Missouri, as well as the American Concrete Institute.

Undergraduate Research

Undergraduate research teams students and faculty on small-scale, focused projects related to architectural engineering and construction. Recent projects include the following:

- Analytically assess the performance of various solid wood shear walls to determine a more ductile lateral-load-resisting system
- Determine the redistribution of loads that exist in other multiple-column situations with six columns, to determine if the redistribution is significant and what redistribution loading pattern exists
- Life-cycle cost analysis of exterior building materials

Faculty

Ray Buyle
Department head, associate professor and Tointon Construction Management Chair

Chris Ahern
Assistant professor

Shannon Casebeer
Assistant professor, and Jim and Carolyn Grier Construction Science Chair

Derek Clements
Instructor

James Goddard
Professor and Hutton Family Distinguished Faculty Fund in Construction Science

Dan Hall
Instructor

Fred Hasler
Associate professor, and John W. and Dorothy M. Burke Architectural Engineering Chair

Paul Karr
Instructor

Julia Keen
Professor, and Bob and Betty Tointon Engineering Chair

Kris Koenig
Instructor

Kimberly Kramer
Professor and G.E. Johnson Construction Science Chair

Katie Loughmiller
Martin K. Eby Distinguished Assistant Professor

Steve Moser
Associate professor

Don Phillippi
Associate professor

Jongchul Song
Associate professor

Raphael Yunk
Professor

Bill X. Zhang
Associate professor

- Distinctly Different: Skills for Successful Women Engineers
- Improving recruitment and retention
- Professional Engineering Exam pass rate by gender

Service

The department's students and faculty are well-recognized on campus and in the local community, as well as regionally and nationally, for their commitment to service and philanthropy through a multitude of student organizations and honor societies that meet a wide variety of student interests. Many of the projects from these cross-disciplinary endeavors seek collaborative solutions to societal problems.

Don Phillippi



Professional Experience

Don Phillippi received his bachelor's degree in civil engineering from California State Polytechnic University, Pomona, and his civil engineering license in 1984 from the state of California. He achieved licensure there as a structural engineer in 1988. Phillippi returned to Cal Poly and received a Bachelor of Architecture degree in 1989 and became a registered architect in California in 1991. He earned a master's degree in structural engineering from Cal Poly in 2004 and a doctorate in structural engineering from the University of California at San Diego in 2010.

As a principal in private practice, he has provided architectural, engineering and forensic services on more than 700 commercial, industrial and residential projects.

Research

Phillippi's research encompasses methods to determine actual load distribution in multi-column bridge and building structures through use of 3D nonlinear programs, and simplified analytical-based fiber models that use basic mechanics of materials. He has created concrete models using stiffnesses of variably, axially and laterally loaded columns to ascertain axial and lateral shear distribution in bridges and buildings, used to determine the state of stress and/or strain of various column components for design or analysis.

His other research involves use of analytical-based models to determine the axial stress-strain relation, and evaluation of transverse and jacket hoop-strain levels around concrete columns wrapped with carbon fiber-reinforced polymer (CFRP) jackets. The research is designed to capture the respective influence of sectional shape and jacket thicknesses to the axial response observed from full-scale column tests and existing test data, in order to provide a better understanding of the mechanical behavior, and to design reliable and efficient CFRP jackets on concrete columns.

Academic Highlights

Phillippi has authored or co-authored peer-refereed journal articles on simplified, two-column, analytical-based fiber models; free fall of self-consolidating concrete in walls three meters high; shear loading in

two-column bridge bents; capacity assessment of v-shaped, two-column bridge bents; and an analytical model for FRP-jacketed square concrete columns in axial compression. He also has authored or coauthored peer-refereed conference papers on use of mechanical couplers in concrete columns and an analytical model for predicting CFRP square concrete-column jacket strains. He is an often-invited speaker and presenter at seminars in his research field. Phillippi is the recipient of the Richard M. Kerschen AGC Fellowship, Mark Keenan Family ARE-CNS Faculty Award, Eugene Thorson Faculty Award, K-State College of Engineering Outstanding Assistant Professor Award and the Hutton Construction Faculty Award.





"The department allows us to examine buildings and the effect that they have on society. An added bonus is the opportunity to collaborate in and build professional connections."

— Katherine Benton, graduate student

Biological and Agricultural Engineering

The department of biological and agricultural engineering is driven by a mission to advance the knowledge and application of engineering and technology to living systems, agriculture and the environment.

Research Activities

Biological and agricultural engineering researchers are leading research and development into issues central to environmental sustainability, biofuel and bio-based products, and precision agriculture and machinery. Research activities in BAE are divided into four focus areas:

Advanced Biological Products

This research focuses on utilization of bio-based materials from existing refinement processes and the development of new value-added products. Research emphasis areas include bio-based materials, co-products utilization, alternative bio-based fuels, specialty human food products, and animal and human biotechnology.

Environment and Ecology

This research focuses on conservation and preservation of natural resources to meet increasing global demands for biological products, and utilization of biosystems in sustainable food systems. Emphasis areas include air quality, climate change, water resources, ecological systems and land-water interaction.

Terra-Machine Mechanics

This research focuses on utilization of new machinery systems, application of technologies, and the role of big data in sustainable food and fiber production systems. Emphasis areas include mechatronics, human interaction, precision technologies, energy and power conversion, and autonomous and robotic machines.

Food Production Systems Intelligence

This research focuses on agricultural systems intelligence. Vision, system integration and data-augmented agriculture are key components of agricultural systems intelligences. Ultimately the goal of systems intelligence is adding economic, environmental and energy (food availability, labor savings) value to food systems.

Faculty

Joseph Harner
Department head and professor

Jonathan Aguilar
Assistant professor

Edwin Brokesh
Instructor

Gary Clark
Senior associate dean and professor

Daniel Flippo
Assistant professor

Stacy Hutchinson
Professor

Zifei Liu
Assistant professor

Ronaldo Maghirang
Associate dean for research and graduate programs and professor

Trisha Moore
Assistant professor

Vahid Rahmani
Assistant professor

Danny Rogers
Professor

Ajay Sharda
Assistant professor

Aleksey Sheshukov
Associate professor

John Slocombe
Professor

Donghai Wang
Professor

Lisa Wilken
Associate professor

Naiqian Zhang
Professor



Ajay Sharda



Professional Experience

Ajay Sharda received a bachelor's degree in agricultural engineering from Punjab Agricultural University, India, in 1998. He then worked for Escorts Ltd. as a service and sales engineer, returning to Punjab Agricultural University in 1999 to earn a master's degree in farm power and machinery in 2001. He then joined the farm power and machinery department there as a research assistant, becoming an assistant professor in 2003. In 2007, Sharda took a sabbatical to join the biosystems engineering doctorate program at Auburn University. He left his tenured position at Punjab Agricultural University in 2012, and became a post-doctoral fellow at the Center for Precision and Automated Agricultural Systems at Washington State University. In 2013, he came to K-State as an assistant professor.

Research

Sharda's research has focused on development, analysis and experimental validation of control systems for agricultural machinery systems with special emphasis on machinery automation, mechatronics, developing automated test setups for hardware-in-the-loop simulations, precision agriculture, data analytics and thermal infrared imaging systems for unmanned vehicles. His research group has developed automated test systems to optimize control systems for advanced precision-planting systems and uses high-speed imaging along with other sensors to develop seed-metering-system evaluations. The group also evaluates and develops newer control systems for pesticide application. It is taking the lead in development of thermal infrared imaging systems, image analysis techniques and decision support tools.

Academic Highlights

Sharda has authored or co-authored one book chapter, 32 journal papers, 14 extension articles and more than 40 conference papers. He has given 45 invited talks, one keynote speech and more than 70 extension

talks. Sharda has directed three master's students, and his current research group has five master's and four doctoral students. He has been named Outstanding Assistant Professor, a K-State College of Engineering Innovator, Engineer Member of the Year of ASABE Kansas section and 2016 Precision Ag Researcher presented by National Conservation Systems. He has secured grants from multinational industries based in the U.S., Germany, Italy and India; state and national commodity boards; and federal agencies such as NSF and USDA. Sharda holds several leadership positions in professional organizations including board member of KARTA, vice-chair of MS 60 unmanned aerial systems committee, and officer and committee member of both the MS 49 crop production systems, and MS 54 precision agriculture committee.



RESEARCH SPOTLIGHT



"K-State has afforded me great opportunities to broaden my laboratory and mentorship skills in an environment that supports creativity and necessitates problem solving. The enthusiasm and tenacity of my faculty advisers, fellow graduate students, and undergraduate research mentees encourages me to strive to make real-world impacts with my research objectives."

— Chelsea Dixon, graduate student



"Working in a newly constructed laboratory with determined students has been beneficial to my professional progress and research. The College of Engineering has provided many opportunities and events to present that research."

— Kseniya Sheshukova, graduate student



Chemical Engineering

The Tim Taylor Department of Chemical Engineering at K-State provides students a solid education in fundamental sciences (chemistry and physics), advanced mathematics and engineering principles. The curriculum is a balanced mixture of engineering theory and practice, with an emphasis on building analytical and communications skills. The degree prepares students for successful careers in industry, academia or government.

Research Activities

Faculty in the department of chemical engineering are developing new processes and materials for generating clean energy efficiently and sustainably, improving human and animal health, increasing agricultural productivity and creating new advanced electronics.

Examples of specific research in the department include the development of —

- New bifunctional catalysts to convert butanediol (produced by the fermentation of biomass) to butadiene, an essential component to synthetic rubber
- New methods for synthesizing ammonia, the world's most popular fertilizer, that do not rely on limited fossil sources
- Models based on molecular theory to predict the best catalysts to achieve the highest conversions and selectivities
- New polymeric nanomaterials to improve therapeutic efficacy of drugs and bioactive compounds by controlling their pharmacokinetics within the body
- Advanced materials and interfaces for use in biological applications, such as micro- and nano-sensors, to detect and characterize microbial pathogens that threaten food and agricultural resources
- Novel semiconductors and photonic materials for sensing and quantum information processing
- Methods for mass production of carbon nanotubes with controlled properties for applications as catalyst supports in Fischer-Tropsch synthesis and photocatalytic oxidation of NO_x

Faculty

James H. Edgar

Department head, University Distinguished Professor and Tom H. Barrett University Faculty Chair in Chemical Engineering

Placidus Amama

Associate professor and Tim Taylor Chair in Chemical Engineering

Jennifer Anthony

Associate professor

Sigifredo Castro Diaz

Teaching assistant professor

Andrew Duncan

Teaching assistant professor

Ryan Hansen

Assistant professor and Steve Hsu Keystone Research Scholar

Urara Hasegawa

Assistant professor

Keith Hohn

William H. Honstead Professor in Chemical Engineering and Coffman University Distinguished Teaching Scholar

Bin Liu

Assistant professor

Won Min Park

Assistant professor

John Schlup

Professor

M. Helal Uddin

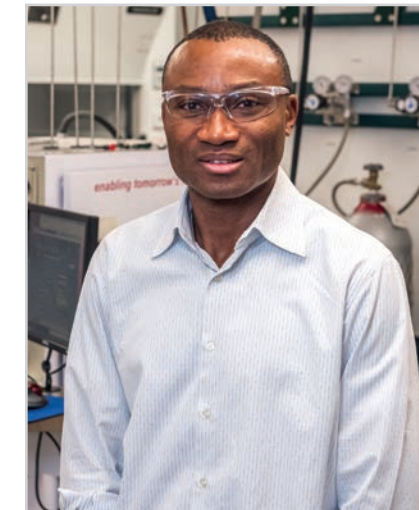
Teaching assistant professor



The students involved in this research receive an excellent educational experience, as they learn new technology, become independent thinkers, improve their communication and analytical skills, and develop new knowledge that will benefit humankind.

Placidus Amama

Tim Taylor Chair in Chemical Engineering



Professional Experience

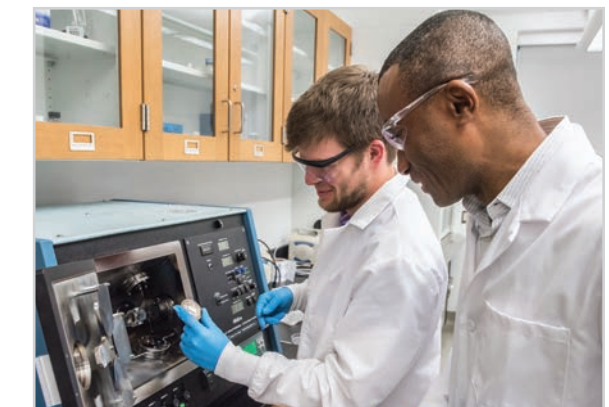
Placidus Amama received a bachelor's degree in chemistry from the University of Calabar, Nigeria, in 1992. He received the Japanese government scholarship for graduate students in 1996 and pursued an integrated program, completing his master's and doctorate in environmental engineering at Yokohama National University, Japan, in 1997 and 2002, respectively. After completion of his doctorate, he conducted two postdoctoral fellowships at the department of chemical engineering at Yale University (2002–04) and Birk Nanotechnology Center, Purdue University (2004–07) as a NASA-INaC fellow. He then worked as a research engineer at the Materials and Manufacturing Directorate, Air Force Research Laboratory from 2007 until he joined the faculty at K-State in August

2013. Amama spent the summer of 2016 working for Nanoconduction, a startup company in Silicon Valley.

Research

Amama's research program focuses broadly on the rational design of catalysts for controlled and scalable growth of carbon nanomaterials using an industrial gaseous waste to exploit their unparalleled material properties in heterogeneous catalysis, electrochemical energy storage and environmental remediation. Many important applications of carbon nanotubes (CNTs) require precise control of their structural properties.

He and his team are developing an in-depth fundamental understanding of the nanoscale phenomena occurring during the growth process that will guide the fabrication of efficient catalysts. Given the unique properties of CNTs and graphene, use of nanocarbons as catalyst supports in the synthesis of clean fuels via Fischer-Tropsch synthesis is being explored. These new supports will improve mass transport of reactants and products, heat dissipation during the exothermic reaction and the stability of the catalyst. They are also interested in understanding CNT enhancement mechanisms in TiO_2 photocatalysis and



developing a pathway for scalable synthesis of efficient visible-light-active CNT-based/ TiO_2 coatings for air purification.

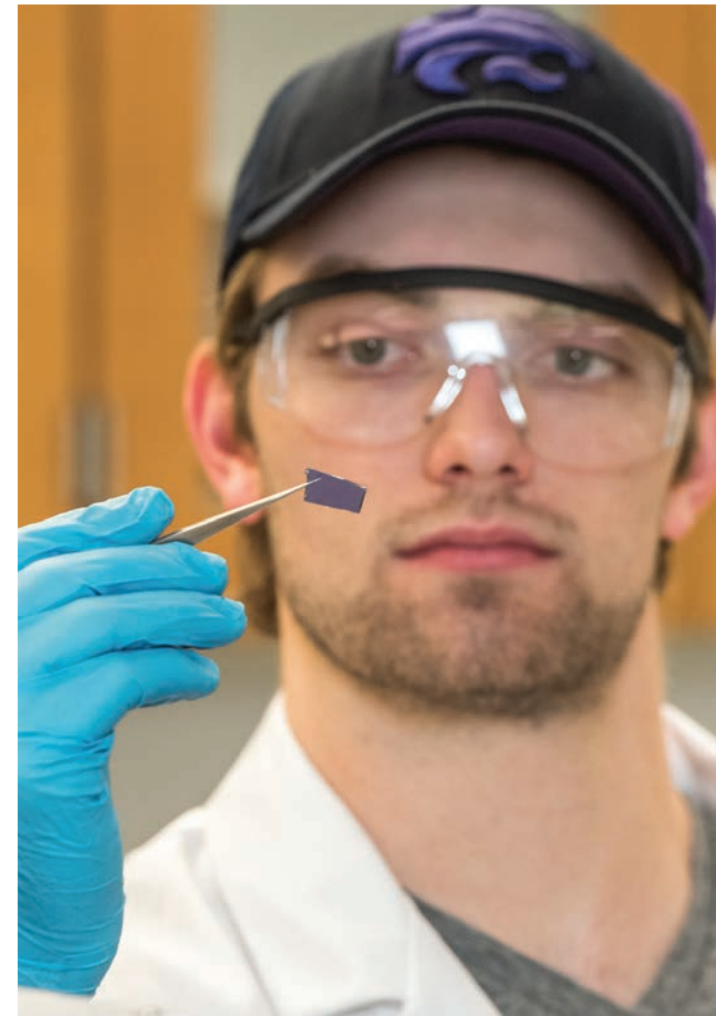
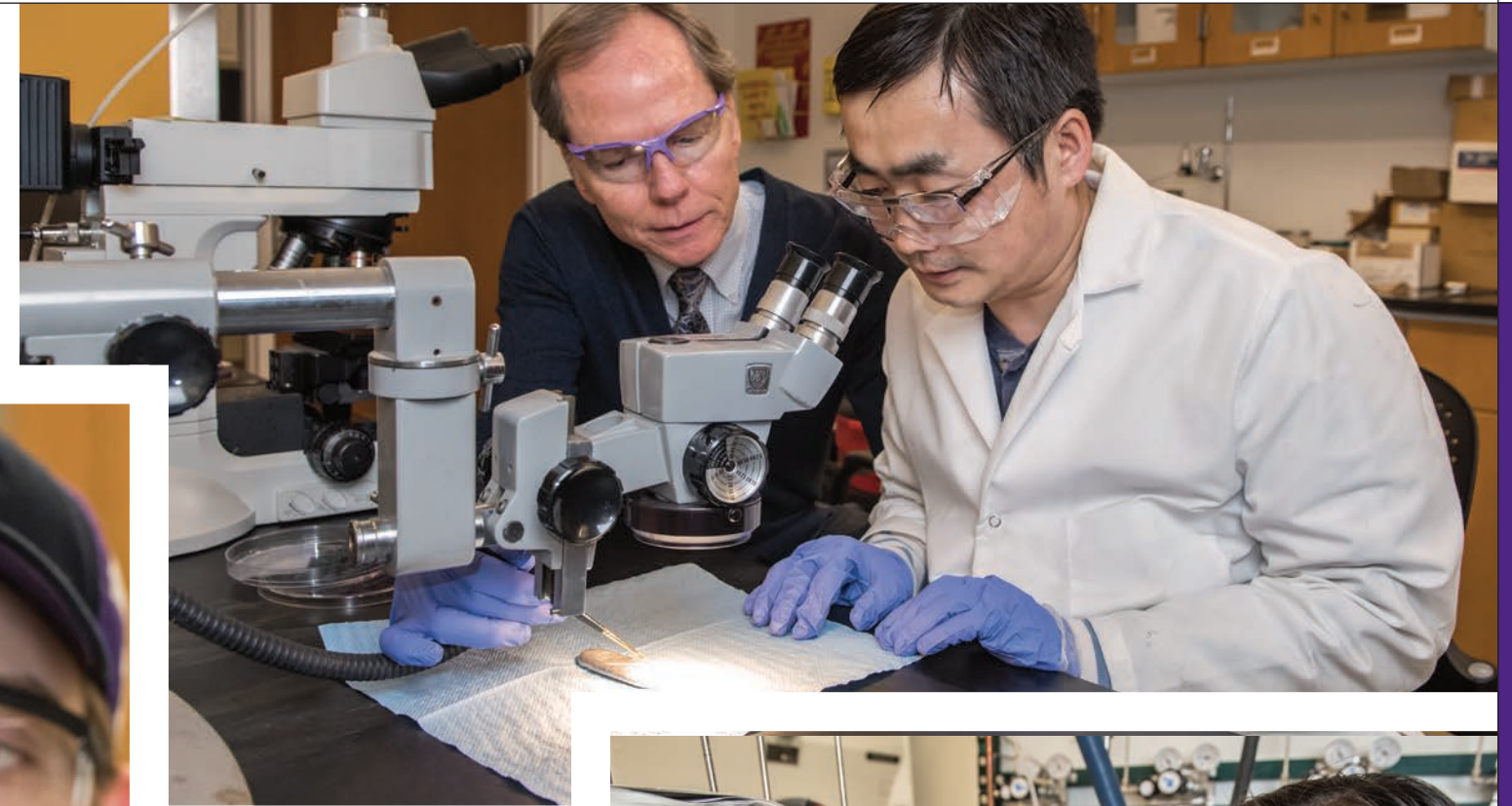
Academic Highlights

Amama has co-authored one book chapter, more than 40 journal papers and more than 50 conference papers, which, as of 2017, have resulted in more than 1,100 citations and an H-index of 18 according to Web of Science. His work has been recognized by several awards including the JSPS Fellowship Award in 2012; KSU Presidential Mentoring Fellowship in 2013; "The Most Approachable Professor" award from chemical engineering undergraduate students in 2014; Air Force Faculty Fellowship (SFFP) Award in 2014, 2016 and 2017; NSF EPSCoR First Awards in 2016; 2016 Outstanding Assistant Professor Award in the College of Engineering; and NSF CAREER Award in 2017.

RESEARCH SPOTLIGHT

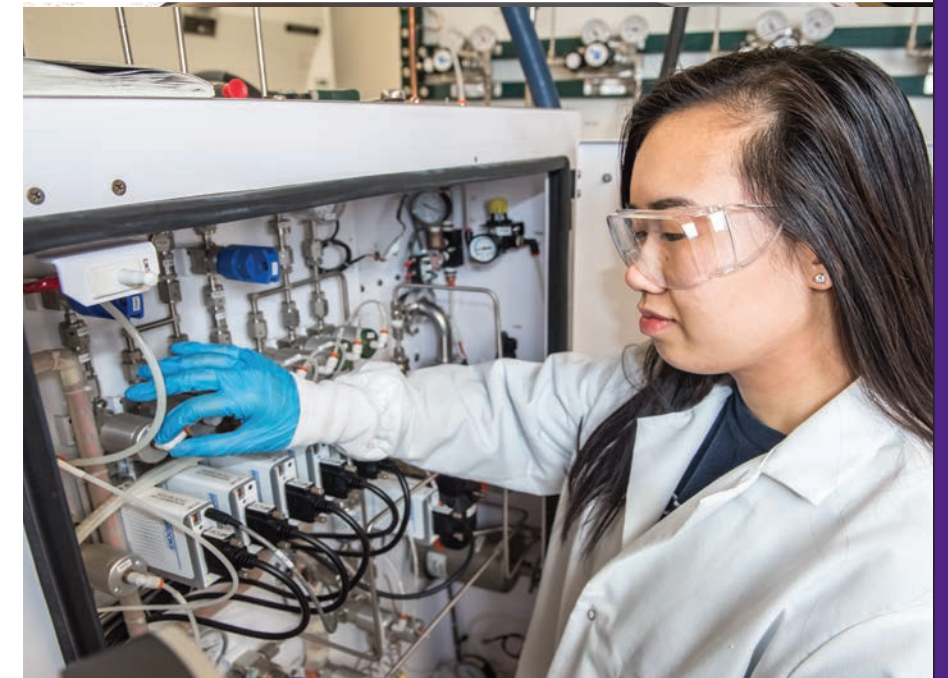
"I have had the pleasure of collaborating with faculty from all across K-State and have worked with students from all over the world. K-State faculty and students are bright, motivated and collaborative."

— Keith Hohn, professor



"I have learned to be more independent since I came here, growing more confident with the progress I have made. Access to K-State facilities has made it possible to hone my experimental skills."

— Abdulhafiz Usman, graduate student



Civil Engineering

The department of civil engineering is a community of learners committed to providing outstanding educational opportunities to students. The improvement of urban infrastructure and access to clean water are among the engineering grand challenges identified by the National Academy of Engineering. Students, staff and faculty are engaged in a variety of state, federal and industry-supported research projects that directly address improvement of urban infrastructure and access to clean water.

Research Activities

Civil and Transportation Infrastructure Engineering

This includes geotechnical engineering, pavement and materials engineering, traffic and transportation engineering, and structural engineering.

Water and Environmental Engineering

This includes surface/groundwater hydrology, hydraulic engineering, environmental engineering, sensing and quantum computing.

Research Facilities

Civil Infrastructure Systems Laboratory

This laboratory houses one of six university-owned accelerated testing facilities in the nation, capable of testing large-scale pavement, structural and bridge elements. This laboratory also houses a large freeze-thaw bed.

Structural Engineering Research Laboratories

The department has state-of-the-art structures and concrete laboratories in Engineering Hall, as well as in Fiedler Hall.

Transportation and Materials Engineering Research Laboratories

Transportation/materials lab facilities include the Concrete, Cement and Aggregate Materials Laboratories; Superpave and Advanced Asphalt Laboratory; and other specialized facilities including nanoindentation, thermogravimetric analysis and microscopy capability.

Geotechnical Engineering Research Laboratories

These laboratories are equipped with conventional testing devices to analyze soil samples according to ASTM Standards

Faculty

Mustaque Hossain

Department head, Civil Engineering
Alumni Professor Honoring
Dr. Robert Snell and Munger
Professor in Civil Engineering

Sunanda Dissanayake

Associate dean of the
Graduate School and professor

Eric Fitzsimmons

Assistant professor

Jeongdae Im

Assistant professor

Christopher Jones

Associate professor

Landon Marston

Assistant professor

Alexander Mathews

Professor

Hani Melhem

Professor, and Darold and
Debbie Davis Cornerstone
Teaching Scholar

Prathap Parameswaran

Assistant professor

Dunja Perić

Associate professor

Robert Peterman

Professor, and Mark H. and
Margaret H. Hulings Chair
in Engineering

Hayder Rasheed

Professor

Scott Schiff

Teaching professor

Stacey Tucker-Kulesza

Assistant professor and Steve
Hsu Keystone Research Scholar

for a variety of routine and specialized tests. Specialized erosion equipment includes a flume-style erosion-function apparatus and a jet-erosion test device. Field equipment includes hand augers for near-surface sampling, an electrical resistivity system and ground-penetrating radar.

Environmental Engineering Research Laboratories

These laboratories are equipped with state-of-the-art facilities for research in applied microbiology, water/wastewater analysis, organics characterization and electrochemical analysis. The major instrumentation includes high-performance liquid chromatographs, ion chromatograph, gas chromatograph, total organic carbon analyzer, spectrofluorometer, and microplate spectrophotometer. Distilled or de-ionized water systems, autoclave, walk-in cold room, chemical fume hoods, biosafety cabinet, centrifuges, anaerobic gassing station, and anaerobic glove box further augment the research capabilities of these fully equipped laboratories.

Jeongdae Im



Professional Experience

Jeongdae Im received his bachelor's and master's degrees in civil and environmental engineering from Seoul National University. Before pursuing his doctorate, he worked for one of the largest construction companies in Korea as a research and development engineer. He designed and operated a pilot-scale membrane bioreactor for wastewater reuse.

In 2006, he came to the United States to pursue a doctorate degree in civil and environmental engineering from the University of Michigan. He worked as a post-doctoral research associate at the University of Tennessee from 2011 to 2015, and as a research assistant professor in the microbiology department at the University of Massachusetts until 2017.

Research

Im's overarching research goal is to promote the development of sustainable biotechnologies for the water-energy-health-climate nexus by examining diverse catabolic activities of microbes, and by harnessing their activities for environmental engineering applications. In this vein, his primary research focus includes investigating biological and biologically mediated abiotic processes that influence contaminant fate and nutrient cycling in natural and engineered systems; deciphering plant-microbe interactions using plant cell cultures for environmental engineering applications; developing biotechnologies for control, reduction and utilization of greenhouse gases (CH₄, N₂O and fluorinated gases); and

understanding the fate of emerging contaminants in the context of human health.

Academic Highlights

Im has been closely collaborating with industry and recently obtained research grants from the American Chemistry Council. Im authored and/or co-authored 20 journal articles, 17 conference papers and three technical reports. He holds two patents, one of which has been successfully applied in more than 40 wastewater treatment facilities in Korea as of 2017. He is an active reviewer for peer-reviewed journals such as Environmental Science and Technology, Applied and Environmental Microbiology, Frontiers in Microbiology, and Frontiers in Bioengineering and Biotechnology.



"K-State has been the perfect fit for me because of the opportunity to be a part of quality research while also advancing my professional skills. I know I will be a better engineer as a result of my research and the guidance I receive from my professors."
 — Luke Augustine, graduate student



"The faculty and students are great to work with. Everyone is easy to approach and talk to, and is very professional. This is the reason I chose K-State for my master's, and now, my doctorate."
 — Jack Cunningham, graduate student



Computer Science

The motto of the department of computer science is simple — world class. Computer science faculty are world-class researchers and teachers who have attracted funding from federal agencies and industry for not only research, but also teaching, curriculum development and K-12 outreach.

Research helps undergraduate and graduate students gain in-depth knowledge and valuable experience that allows them to become even more effective problem solvers, applying software in a variety of disciplines.

Faculty areas of expertise include cybersecurity, cyber-physical systems, data science and high-assurance computing. Points of pride include designation as a National Center of Academic Excellence for Research in Cybersecurity by the National Security Agency and the Department of Homeland Security, a high level of multidisciplinary research and teaching, excellent placement of students after graduation, a University Distinguished Professor, and extremely active and competitive student organizations.

Research Activities

High Assurance

Faculty at the Laboratory for Specification, Analysis and Transformation of Software, or SANToS, conduct research in foundational techniques, robust tools and practical integrated methodologies for building safety- and security-critical software systems.

Cybersecurity

Faculty at the Center for Information and Systems Assurance conduct research in information assurance and computer security, teach our students about information assurance and engage the professional community in collaborative efforts.

Cyber-Physical Systems

K-State cyber-physical system research explores design, development, analysis, verification and validation of embedded control systems in a variety of application domains such as automotive, aerospace, ground and aerial unmanned

Faculty

Scott DeLoach
Department head and professor

George Amariuca
Associate professor and
Michelle Munson-Serban
Simu Keystone Research Scholar

Torben Amtoft
Associate professor

Daniel Andresen
Professor

Nathan Bean
Instructor

Doina Caragea
Professor and Michelle
Munson-Serban Simu
Keystone Research Scholar

John Hatcliff
University Distinguished
Professor and Lucas-Rathbone
Professor in Engineering

Rodney Howell
Associate professor

William Hsu
Professor

Dennis Lang
Teaching Assistant Professor

Masaaki Mizuno
Professor

Arslan Munir
Assistant professor and
Michelle Munson-Serban Simu
Keystone Research Scholar

Mitchell Neilsen
Professor

Pavithra Prabhakar
Associate professor, and
Peggy and Gary Edwards
Chair in Engineering

Venkatesh Ranganath
Assistant professor

Robby
Professor

Julie Thornton
Instructor

Jorge Valenzuela
Teaching assistant professor

Eugene Vasserman
Associate professor and
Michelle Munson-Serban Simu
Keystone Research Scholar

Josh Weese
Teaching Assistant Professor

vehicles, Internet of Things, building control, agriculture, robotics systems and mobile applications.

Data Science

Computer science is a recognized leader in applied machine learning in areas such as predictive analytics, business intelligence and data mining. Core strengths include the analysis of natural language text; linked, spatial and temporal data; security data; and biological data.

Mitchell Neilsen



Professional Experience

Mitchell Neilsen received master's degrees in mathematics and computer science, as well as a doctorate degree in computer science, from Kansas State University. He began his professional career as an assistant professor in computer science at Oklahoma State University. In 1996, he returned to K-State as an assistant professor. He currently holds the rank of professor and serves as the graduate program director for the department of computer science.

Research

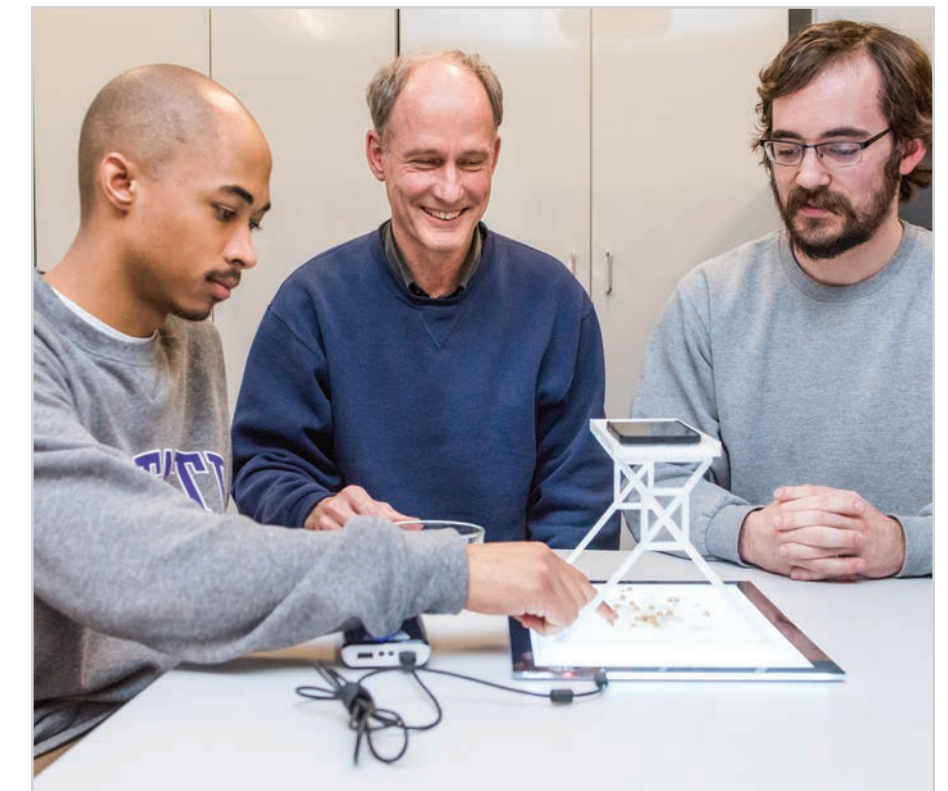
Neilsen's research activities are currently focused in the areas of cyber-physical systems, scientific computing – finite element analysis and computational fluid dynamics with a focus on thermal battery modeling and dam safety research,

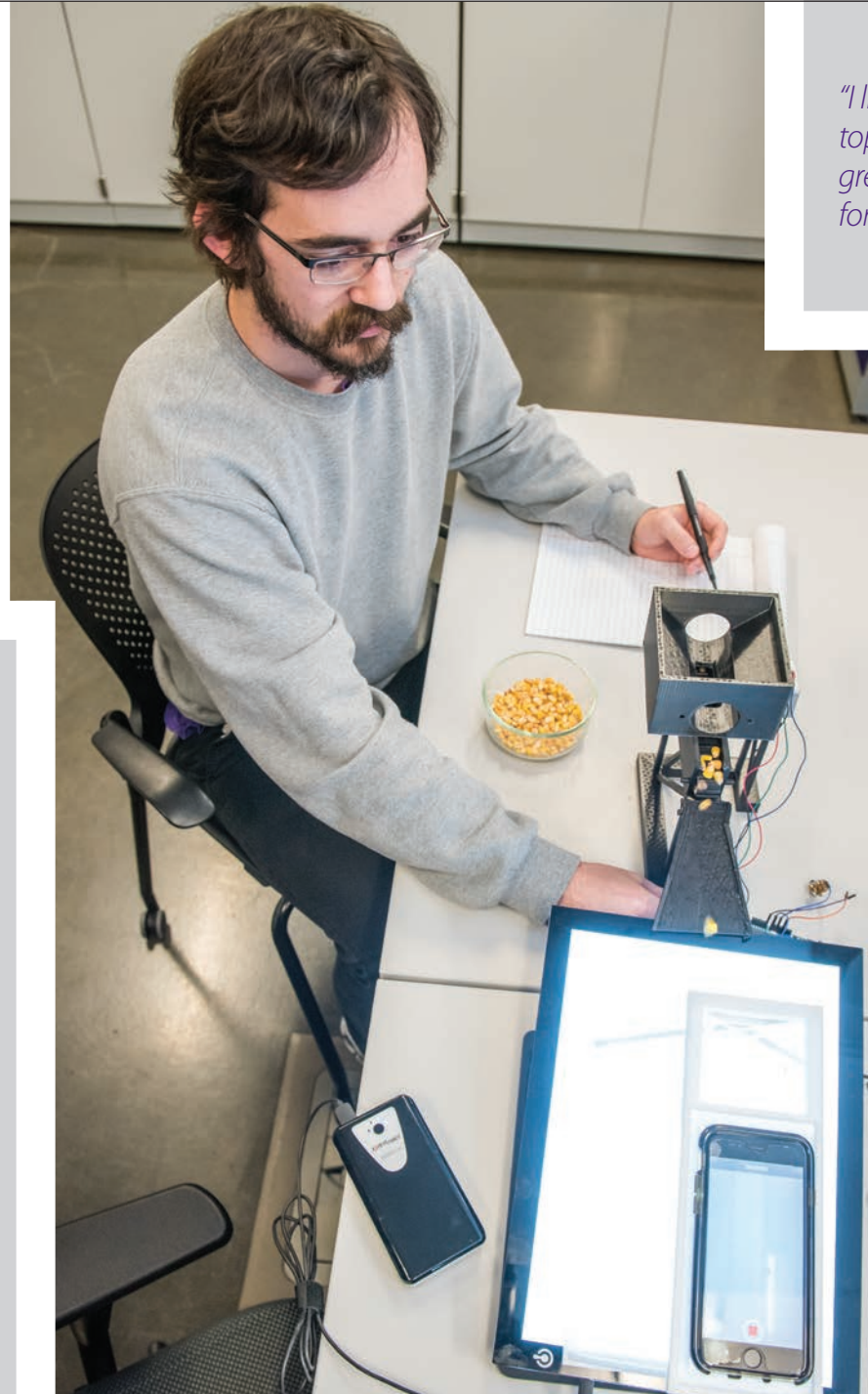
mobile applications and high-throughput phenotyping. His research projects are funded by the National Science Foundation, U.S. Department of Agriculture, Sandia National Laboratories, Department of Homeland Security and private industry.

Academic Highlights

Neilsen has been active in integrating computer science into science, technology, engineering and math disciplines at all levels, including several projects funded by the

National Science Foundation. These STEM projects include research experiences for undergraduates and teachers sites, combined research and curriculum development on real-time embedded systems, and, most recently, a GK-12 STEM fellowship program entitled INSIGHT: Infusing System Design and Sensor Technology in Education. He has received several awards for research and academic activities, and is a strong proponent for integrating computing concepts into the K-12 curriculum.

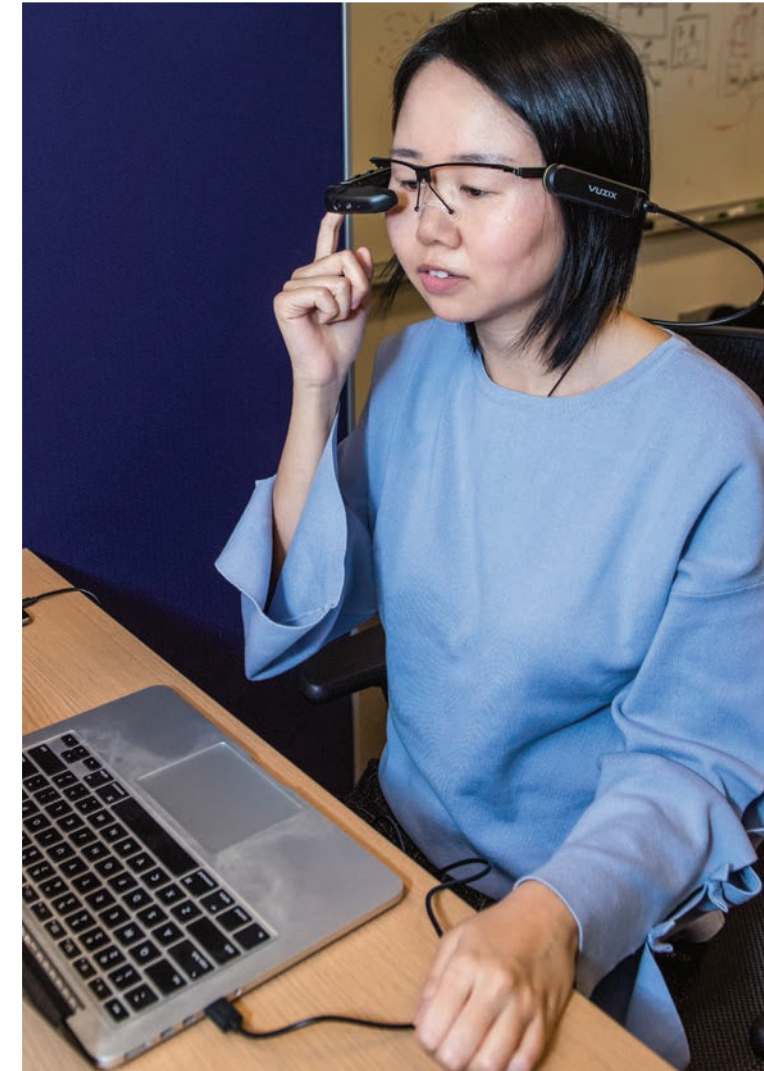




"I like the freedom that research gives me to explore different topics that I am interested in. K-State has always given me a great base to do research, and encourages me to keep moving forward and learning as much as I can."
— Yihong Theis, graduate student



"The faculty are wise, supportive and have high expectations. We are creating the state of the art and pushing the envelope in various research realms. We create software for scientists across the world; in turn, we are exposed to new cultures and research avenues."
— Chaney Courtney, graduate student



Electrical and Computer Engineering

The department of electrical and computer engineering strives to be a top-performing department in both research and teaching in the College of Engineering.

The department embraces the philosophy that faculty excellence leads to strong undergraduate and graduate programs. Recruiting and retaining top faculty is critical, and the department has many faculty members who hold endowed chairs or professorships, four who are fellows of the Institute of Electrical and Electronics Engineers, and one who is a Jefferson Science fellow.

Funding for departmental research comes from a variety of sources including the National Science Foundation; National Institutes of Health; NASA; Burns & McDonnell; Westar Energy; Black & Veatch; and the U.S. Departments of Energy, Agriculture and Homeland Security.

Research Activities

Advanced Power and Energy Systems

The advanced power and energy systems area includes research in power systems, power electronics, alternative energy, computer networking, communication and controls, intelligent systems, optimization and cybersecurity.

Biomedical

Research in the biomedical area includes development of devices for both human and animal health care. This includes biomedical sensors, therapeutic medical devices, embedded systems, bio-fabrication, communication circuits, wireless communications, energy harvesting, signal processing, brain computer interfaces, biosecurity and image processing.

Systems and Networks

The systems and networks area includes research in communication systems, controls, optimization, network science, epidemic modeling, artificial intelligence, information theory, data fusion, cybersecurity, biosecurity and big data.

Faculty

Don Gruenbacher

Department head, associate professor, and George J. and Alice D. Fiedler Distinguished Chair in Electrical and Computer Engineering

Satish Chandra

Associate professor

Sanjoy Das

Associate professor

Darren Dawson

Dean, professor, and LeRoy C. and Aileen H. Paslay Chair in Engineering

Dwight Day

Associate professor

John Devore

Professor

Fariba Fateh

Assistant professor

Mohammad Nazif Faqiry

Research assistant professor

William Hageman

Assistant professor

Jungkwun "JK" Kim

Assistant professor and Michelle Munson-Serban Simu Keystone Research Scholar

Sungo Kim

Associate professor and Michelle Munson-Serban Simu Keystone Research Scholar

Bill Kuhn

Professor

Behrooz Mirafzal

Associate professor and Michelle Munson-Serban Simu Keystone Research Scholar

Bala Natarajan

Clair N. Palmer and Sara M. Palmer Electrical Engineering Professor

Anil Pahwa

University Distinguished Professor, and Logan-Fetterhoof Electrical and Computer Engineering Faculty of Distinction Chair

Garrett Peterson

Instructor

Punit Prakash

Paul L. Spainhour Associate Professor in Electrical Engineering and Michelle Munson-Serban Simu Keystone Research Scholar

Andrew Rys

Professor

Caterina Scoglio

Paslay Professor in Electrical and Computer Engineering

Mohammad Shadmand

Assistant professor and Michelle Munson-Serban Simu Keystone Research Scholar

Dave Thompson

Assistant professor

Steve Warren

Professor

Hongyu Wu

Assistant professor and Michelle Munson-Serban Simu Keystone Research Scholar

Punit Prakash

Paul L. Spainhour Associate Professor in Electrical Engineering and Michelle Munson-Serban Simu Keystone Research Scholar



Professional Experience

Punit Prakash received a bachelor's degree in electrical and computer engineering from Worcester Polytechnic Institute in 2004, and a doctorate in biomedical engineering from the University of Wisconsin-Madison in 2008. In 2009, he joined the department of radiation oncology at the University of California, San Francisco as a postdoctoral scholar, and was promoted to research specialist in 2009. Prakash came to K-State as an assistant professor in 2012. He was promoted to associate professor and awarded tenure in 2018, and is an affiliate of the K-State Johnson Center for Cancer Research.

Research

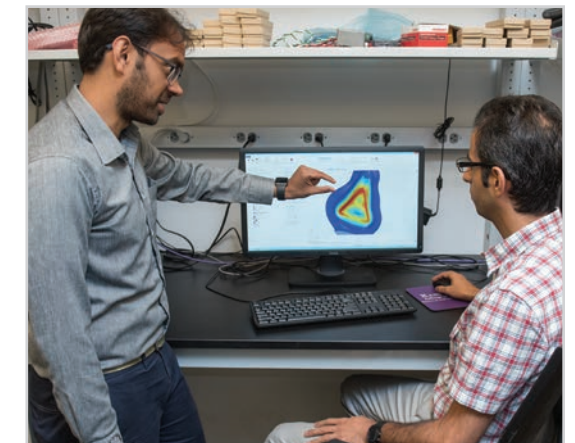
Prakash directs research in the Biomedical Computing and Devices Lab (BCDL), which he established at

K-State in 2012. Research in the BCDL focuses on developing technologies for enabling precise image-guided medical interventions. Current thrusts include development of electromagnetic (microwave/RF) technologies for controlled delivery of therapeutic energy, integration of therapeutic instrumentation with MRI to enable imaging-based feedback-controlled interventions and model-based predictive planning of image-guided thermal therapies. Major research accomplishments include development of the first integrated platform for pre-clinical microwave thermal therapy investigations in small animals under 14 T ultra-high-field MRI guidance, and design and in vivo experimental demonstration of a device affording directional control of microwave radiation for precise thermal ablation of tumors. Research in the BCDL is funded by support from the National Institutes of Health, National Science Foundation and the medical imaging/device industry.

Academic Highlights

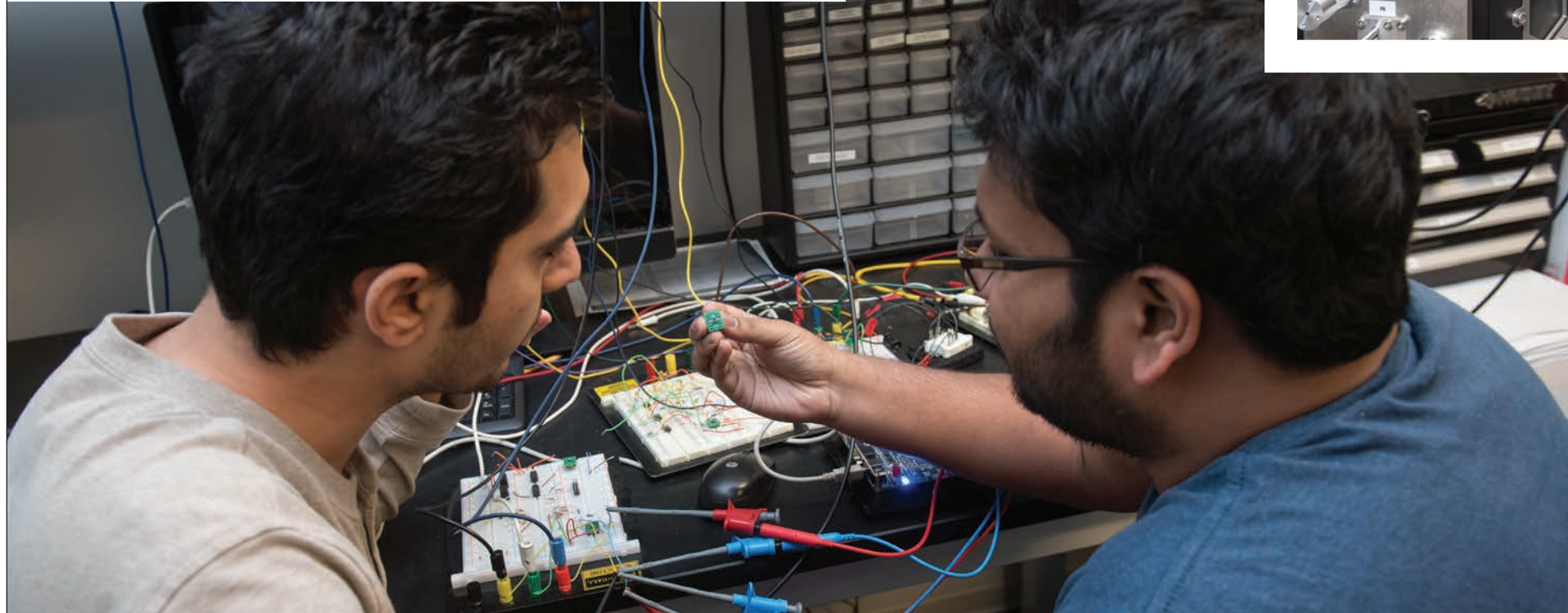
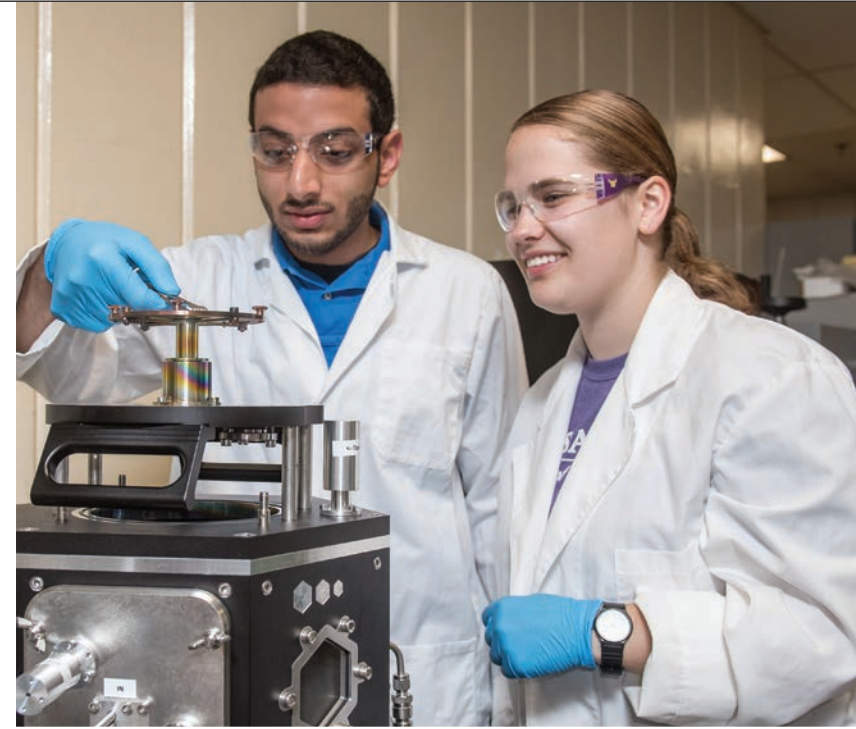
Prakash is a recipient of the K-State College of Engineering Outstanding Assistant Professor Award (2017), Innovative Research Award from the K-State Johnson Cancer Research Center (2012 and 2014) and the K-State Faculty Development Award (2012). He has authored and/

or co-authored more than 30 peer-reviewed journal publications and more than 50 conference presentations. He is an inventor on five patents (one issued, four pending). He was elected chair of the IEEE Engineering in Medicine and Biology Society's technical committee on therapeutic systems and technologies (2016-17). He is section editor – thermal ablation engineering/physics – for the International Journal of Hyperthermia, and a member of the editorial board of Critical Reviews in Biomedical Engineering. At K-State, Prakash collaborates closely with colleagues from engineering, veterinary medicine, chemistry and mathematics. He has developed standing collaborations with clinicians and colleagues from the Medical University of South Carolina, the National University of Ireland-Galway, Brown University/Rhode Island Hospital and the University of Kansas Medical Center.



RESEARCH SPOTLIGHT

"I like doing research at K-State because of the passion and drive of my colleagues. They motivate me to work harder and are truly like family to me. They are always willing to help and support me in achieving my goals, and always have my best interest at heart."
— Lawryn Edmonds, graduate student



Industrial and Manufacturing Systems Engineering

Industrial engineers strive to continuously improve the design, analysis, and operation of systems that produce and deliver goods and services. The same drive for optimization can be seen throughout the department of industrial and manufacturing systems engineering in its research and graduate programs.

Faculty work hard to ensure the IMSE graduate programs are personal and challenging. Through classwork and collaborative research, they foster students' creativity and drive for success. IMSE graduates are in high demand as engineers, analysts and management associates. Throughout their careers, many establish themselves as prominent leaders, serving as members of the National Academy of Engineering, and rising to such esteemed positions as university presidents, military generals and captains of industry.

Research Activities

Advanced Manufacturing

Research in advanced manufacturing focuses on difficult-to-machine materials, additive manufacturing and energy manufacturing. Research strengths include laser micromachining, ultrasonic machining, machining of semiconductor wafers and 3D printing of advanced materials. Additional research in manufacturing systems examines multivariate statistical control.

Operations Research

Researchers contribute to the theoretical foundations and modern applications of operations research. They conduct key fundamental research in discrete optimization, mathematical programming, and dynamic systems modeling and optimization. Recent applications of IMSE research include health systems modeling, humanitarian logistics, pattern recognition and scheduling.

Systems Engineering

Researchers in this area work to optimize a variety of complex systems. Their research groups have concentrated efforts on the increasingly complex systems in humanitarian logistics, healthcare operations, transportation engineering, quality production systems, and product and technology development.

Faculty

Bradley Kramer

Department head, professor, and Ike and Letty Evans Engineering Chair

David Ben-Arieh

Professor

Deandra Cassone

Senior professor of practice

Shing I. Chang

Associate professor

Suprem Das

Assistant professor

Timothy Deines

Senior instructor

Todd Easton

Associate professor, Coffman University Distinguished Teaching Scholar, and Ike and Letty Evans Cornerstone Teaching Scholar

Shuting Lei

Carl R. and Mary T. Ice Industrial Engineering Professor

Dong Lin

Assistant professor

Malgorzata Rys

Associate professor

Ashesh Sinha

Assistant professor

Jessica Heier Stamm

Associate professor and Steve Hsu Keystone Research Scholar

Chih-Hang (John) Wu

Associate professor

Meng (Peter) Zhang

Assistant professor and Steve Hsu Keystone Research Scholar



Jessica Heier Stamm

Steve Hsu Keystone Research Scholar



Professional Experience

Jessica Heier Stamm joined the department of industrial and manufacturing systems engineering at K-State as an assistant professor in 2010, and was promoted to associate professor in 2018. She holds a bachelor's degree in industrial engineering from K-State, and a doctorate in industrial and systems engineering from the Georgia Institute of Technology.

Her research and teaching collaborations span numerous public and private sector organizations including Heart to Heart International, U.S. Centers for Disease Control and Prevention, Pan American Health Organization, Kansas Department of Health and Environment, Kansas Department of Agriculture, FedEx Express and BNSF Railway.

Research

Heier Stamm's research interests include development of quantitative models and algorithms to design and improve humanitarian relief and public health logistics systems. She uses operations research and game theory tools to analyze systems in which decisions about system control are made in a decentralized way. This work addresses two central research questions: (1) What is the impact on system effectiveness as a result of decentralization? (2) How can systems be designed to mitigate adverse effects of decentralization? Answers to these questions have direct implications for designing and managing supply chain systems that support health. Heier Stamm's group was the first to synthesize literature describing applications of game theory modeling to humanitarian operations. Their work on theoretical properties of decentralized humanitarian logistics systems led to new performance bounds and coordination mechanisms for improving decentralized systems.

Heier Stamm's pedagogical research aims to increase current knowledge regarding students' understanding of and interest in ways industrial engineering makes a difference in people's lives, which is paving the way for educational strategies that improve recruitment and retention, particularly for those from groups historically underrepresented in engineering.

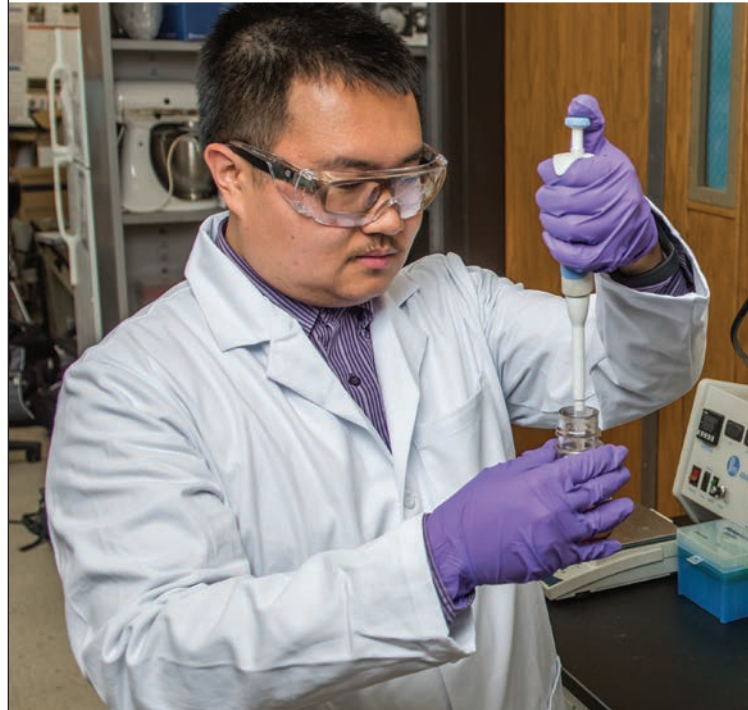
Academic Highlights

Heier Stamm won the 2016 College of Engineering Outstanding Assistant Professor Award. Her research has been supported by the National Science Foundation's Broadening Participation Research Initiation Grants in Engineering, Coupled Natural and Human Systems and Faculty Early Career Development (CAREER) programs. In 2014, Heier Stamm was named a fellow in the NSF-funded Enabling the Next Generation of Hazards and Disasters Researchers program, recognizing her group's contributions to interdisciplinary scholarship in the area of disaster research. The IMSE department's graduating seniors selected her as Outstanding Teacher in 2013-14, 2016-17 and 2017-18. She received the 2011 dissertation prize from the Transportation Science and Logistics Society of the Institute for Operations Research and the Management Sciences, and the 2013 Best Doctoral Thesis award from the Humanitarian Logistics and Supply Chain Research Institute.



"I really like working with K-State faculty. They are very supportive and guide me in the right direction to achieve my research goals."

*— Ugandhar Delli,
graduate student*



Mechanical and Nuclear Engineering

The department of mechanical and nuclear engineering is the largest in the College of Engineering. The department generates millions of dollars in external funding expenditures every year and operates the following nationally recognized laboratories:

- Semiconductor Materials and Radiological Technologies Laboratory
- Institute for Environmental Research
- Nanoscience and Engineering Laboratory
- National Gas Machinery Laboratory
- 1.25 MW TRIGA Mark II research reactor

Research Activities

Radiation Detection and Applications

The Semiconductor Materials and Radiological Technologies, or SMART, Lab at K-State is the preeminent radiation-detection laboratory in the country. It has two clean rooms, and fabrication and characterization equipment. Detectors of all types are designed, constructed and tested at the SMART Lab.

Environment

The Institute for Environmental Research has been in existence for more than 30 years, and is a national resource for research and testing. The IER is involved in research in human comfort, indoor environments and other aspects of thermal sciences.

Composites

MNE faculty perform research in nano- and macro-composites. Nano-composites hold promise for improved battery performance and energy storage. Macro-composites are used to produce light aircraft components and textile materials with improved properties such as resistance to projectile impact.

Transportation

MNE faculty collaborate with faculty in other departments to investigate transportation topics such as concrete railroad ties, where improving their properties will lengthen life-cycle use.

Nuclear Reactor Neutronics and Thermal Hydraulics

Faculty perform leading-edge research on reactor core calculations and thermal hydraulics for next-generation power reactors.

Faculty

William L. Dunn

Department head, professor and Steven M. and Kay L. Theede Chair in Engineering

Amir Bahadori

Assistant professor

B. Terry Beck

Professor

Amy Betz

Associate professor

Hitesh Bindra

Associate professor and Steve Hsu Keystone Research Scholar

Ron Brockhoff

Instructor

Liang-Wu Cai

Associate professor

Jason Clement

Instructor

Melanie Derby

Hal and Mary Siegele Assistant Professor in Engineering

Steven J. Eckels

Professor

Donald L. Fenton

Professor

Jared Hobeck

Assistant professor

Mohammad H. Hosni

Professor, and Charles and Nona Frankenhoff Chair in Engineering

Byron W. Jones

Professor

Kevin Lease

Associate professor

Zayd C. Leseman

Associate professor

Douglas McGregor

University Distinguished Professor, and Boyd D. Brainard Departmental Faculty Chair in Mechanical and Nuclear Engineering

Walter McNeil

Assistant professor

David Pacey

Professor

Jeremy Roberts

Assistant professor and Steve Hsu Keystone Research Scholar

Dale Schinstock

Associate professor

J. Kenneth Shultis

Professor, and Ike and Letty Evans Cornerstone Teaching Scholar

Gurpreet Singh

Harold O. and Jane C. Massey Neff Associate Professor in Mechanical Engineering

Saeed Tiari

Instructor

Youqi Wang

Professor

Kevin Wanklyn

Teaching assistant professor

Mingjun Wei

Harold O. and Jane C. Massey Neff Associate Professor in Mechanical Engineering

Warren White

Associate professor

Jack Xin

Associate professor

Hitesh Bindra

Steve Hsu Keystone Research Scholar



Professional Experience

Hitesh Bindra obtained a bachelor's degree in chemical engineering from Panjab University in 2002. He then worked as a scientific officer for the Indian government, undertaking nuclear power projects from 2002 to 2005. In 2005, he moved to the University of Illinois at Urbana-Champaign to pursue graduate studies in nuclear engineering and worked at a simulation center at Caterpillar Inc. After receiving his doctoral degree in 2010, he moved to City University of New York (CUNY) Energy Institute for postdoctoral research on thermal energy storage and high-temperature systems. His research work at CUNY led to several inventions and their further commercialization. Bindra came to K-State in spring 2014 and has established the Nuclear Energy

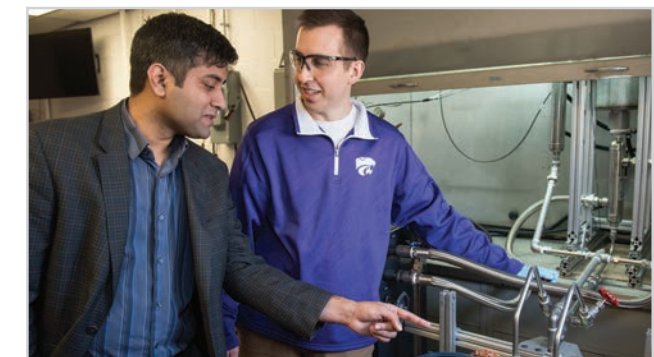
Systems Transport (Nu-EST) Laboratory. He has more than 15 years of research and development experience in nuclear/thermal engineering, and has been involved in several industrial and academic research projects.

Research

Bindra's research interests are in understanding and advancing the passive safety of nuclear reactors, high-temperature energy systems and thermal storage. Research activities in his group, Nu-EST Lab, focus on understanding micro- to macro-scale phenomena, which impact the safety and performance of nuclear reactors. His research lab investigates complex thermo-fluid physics such as thermal stratification, mixing, multiphase flow, and complex fluid-solid interactions under high-temperature and chemical reactions. Current research projects funded by the U.S. Department of Energy involve designing and evaluating safety systems of advanced nuclear reactor technologies. Some of the unique capabilities in the Nu-EST Lab include a liquid-metal thermal-hydraulic test loop, Rayleigh backscattering-based distributed-temperature measurement system, ultrasonic Doppler velocimetry, and high-speed neutron or X-ray imaging system for multiphase flows.

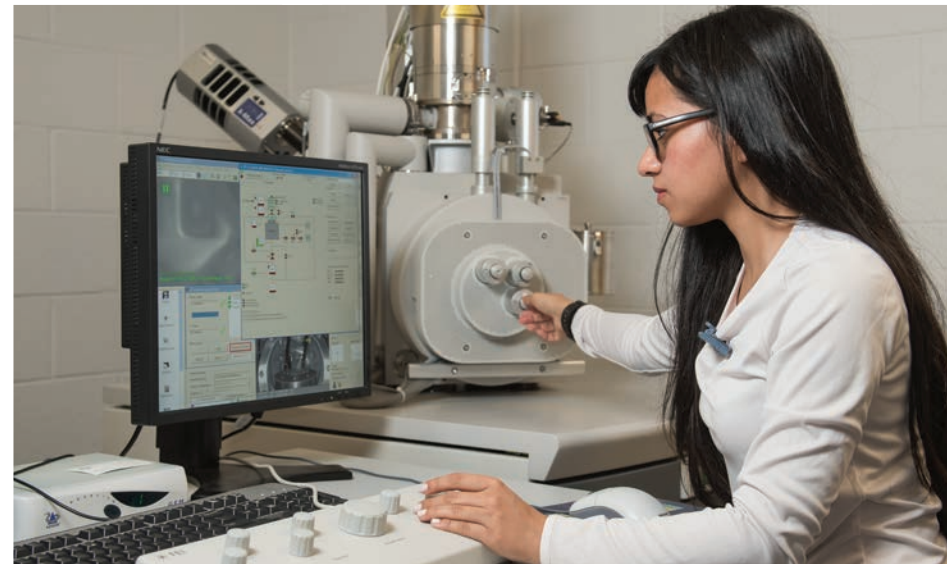
Academic Highlights

Bindra has authored more than 45 peer-reviewed publications in journals and conference proceedings. He has been granted two patents on his energy storage inventions and released a book on thermal energy storage for nuclear reactors in 2018. His research group has presented several talks at national/international conferences, universities and workshops. His undergraduate and graduate students have won awards at university and national levels for their research presentations. Bindra was a 2017-18 Big 12 Faculty Fellow and recipient of an NSF-EPSCoR First Award. He has received the Bruce W. Spencer and Sargent & Lundy fellowships for outstanding research and academic achievements as a graduate student. Bindra is currently serving as the vice-president of the Alpha Nu Sigma Honor Society and has been elected to serve as the president for the term 2019-20. He is an active reviewer for top journals in the field of nuclear energy, thermal sciences and fluid mechanics.



"I chose K-State because I am able to take what I learn in the classroom and apply it directly to my research to see real-world results. The experience that I gain here is invaluable and there are very few other places I would have access to the same resources."

— Robyn Hutchins, undergraduate student

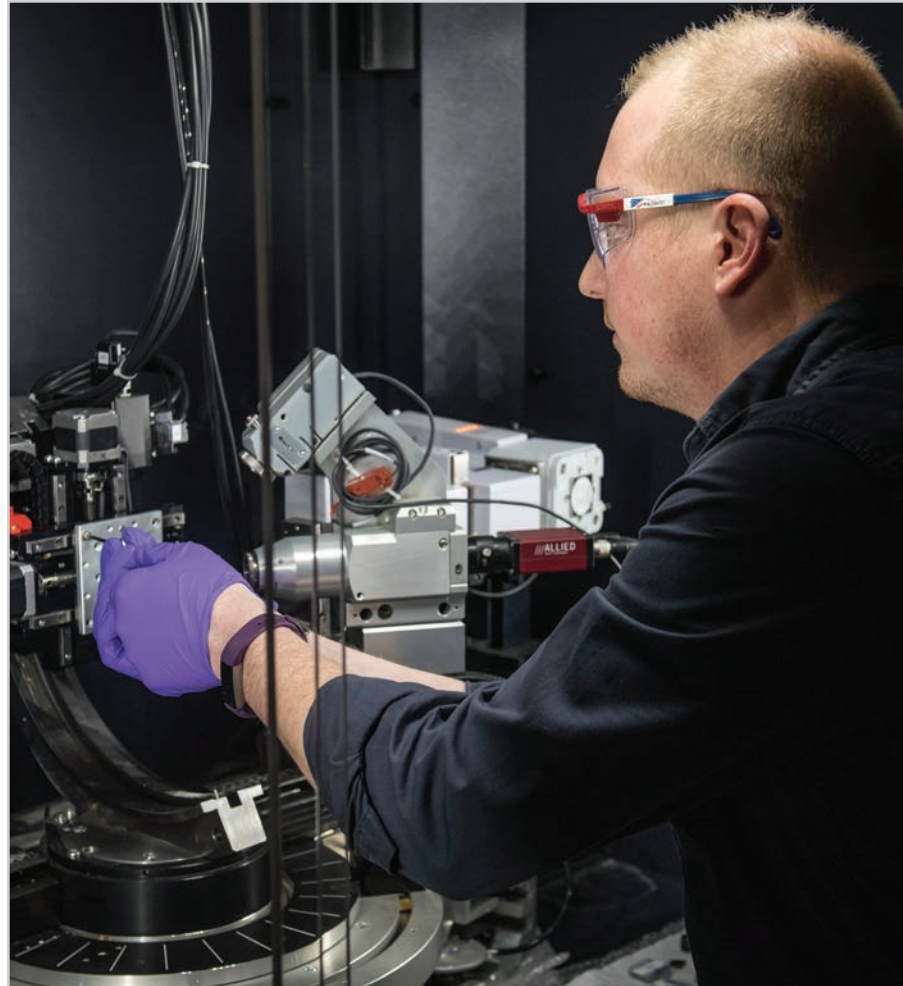


"I am constantly learning and evolving in my lab, and my research has grown tremendously. I have been given the opportunity to build new technology and contribute to a safer world."

— Priyarshini Ghosh, graduate student

Faculty Development Initiatives

A great research program begins with great research faculty — inspiring advisers and scholars who want to make a difference in the lives of engineering graduate students and in the larger world. Decades after leaving K-State, graduate student alumni still remember the dedicated faculty who helped them to understand a difficult research topic, compose high-impact publications, and find the path to personal and professional success. Those life-changing conversations continue to take place at the College of Engineering every day as our faculty members share their passion for engineering, and their commitment for research and advising our graduate students. Specifically, faculty lead the way in addressing urgent national and global issues, from homeland security to sustainable energy, and our aspiration to pursue academic excellence in all endeavors depends upon their achievements. These faculty members also bring extraordinary insight and enthusiasm to our classrooms while mentoring our graduate students in discovery-based projects in preparation for the next generation of academics, scholars and engineering leaders.



“Engineering undergraduate and graduate students, working alongside top-notch engineering faculty at our outstanding facilities, have the great opportunity to learn from some of the brightest and best in cutting-edge fields of study.”

*— Ronaldo Maghirang,
associate dean for research and graduate programs*

Keystone Research Scholars Program

The reputation of a great university is amplified by the research impact of its faculty. A Keystone Research Scholar title is bestowed upon a faculty member who has made outstanding research contributions that address urgent national and global issues. This type of named position allows K-State to recruit and retain dynamic scholars who are in the early stages of their career, but yet are in high demand at all universities throughout the nation. By providing targeted funding for ground-breaking exploration and inquiry, the research scholars program enables talented, early-career faculty members to catapult their intellectual activities to higher levels of achievement.

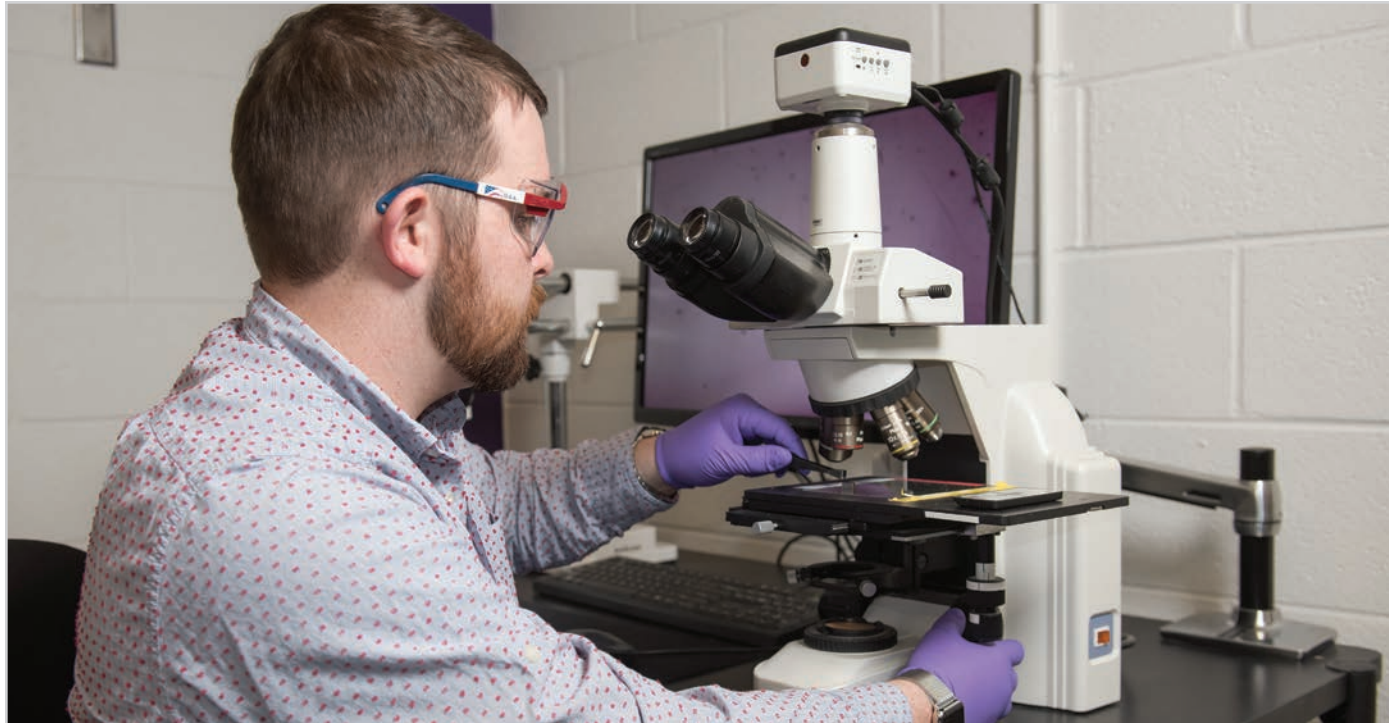
Based on a previous record of outstanding research accomplishments, faculty members are nominated by their department head for research scholar positions in each of the departments throughout the college. Each Keystone Research Scholar is given a three-year appointment with a salary supplement and discretionary funds to support the purchase of specialized equipment, provide travel support and/or fund additional graduate students to be part of their research team. The accomplishments of a research scholar are closely reviewed to ensure the holder maintains academic excellence and high student interest.

“The beauty of a gift to support faculty is that it can provide seed funding for high-risk, high-payoff research. Through their tremendous commitment to investing in K-State and our successful faculty members, donors advance our vision to pursue academic excellence in all of its endeavors.”

*— Darren Dawson,
dean*



Faculty Development Initiatives



Endowed Professorships and Chairs

The excellence of any university depends on its faculty. An endowed professorship or chair is bestowed upon faculty members who have made extraordinary contributions to research and teaching. These types of endowed positions enable K-State to offer competitive compensation packages in recruiting and retaining faculty who are in high demand around the country and the world. Those who hold endowed professorships represent the most distinguished faculty members of their generation while the endowed chair represents the highest honor K-State can confer on a prominent faculty member. By providing dedicated resources for innovative research and teaching opportunities, endowed professorships and chairs enable the most gifted faculty members to excel in their scholarly activities.

Based on a previous record of outstanding research and teaching accomplishments, faculty members are nominated by their department head for endowed positions in each of the departments throughout the college. A holder of an endowed professorship or chair is given a five-year, renewable appointment with a salary supplement and discretionary funds to support the purchase of specialized equipment, provide travel support and/or fund additional graduate students to be part of their research team. The accomplishments of an endowed professorship or chair are closely reviewed to ensure the holder maintains academic excellence and high student interest. Currently, the College of Engineering has more than 30 endowed professorships and chairs.

Giving Opportunities

Your gift will ensure that great educators will continue to make a difference in the lives of K-State engineering students in the following ways:

Naming of a Departmental Keystone Research Scholar

Your gift to name a research scholar will allow us to recruit and retain dynamic faculty in the early stages of their careers.

- Expendable gift of \$10,000/year for three years, or
- Endowment gift of \$250,000, payable through pledge of up to five years

Naming of an Endowed Professorship

Your gift to name an endowed professorship will allow us to recruit and retain outstanding faculty.

- Endowment gift of \$1 million, payable through pledge of up to five years

Naming of an Endowed Chair

Your gift to name an endowed chair will allow us to recruit and retain prominent faculty.

- Endowment gift of \$2 million, payable through pledge of up to five years

Impact of Philanthropy

Thank you for considering an investment in competitive recruitment of excellent faculty and rewarding them at a level that keeps them at K-State. Your investment in the dedicated faculty who educate K-State engineering students in and out of the classroom will guarantee our strong teaching tradition for generations to come. To learn how you can invest, contact the engineering development office at 785-532-6266 or engineering@ksufoundation.org



Notice of nondiscrimination

Kansas State University prohibits discrimination on the basis of race, color, ethnicity, national origin, sex (including sexual harassment and sexual violence), sexual orientation, gender identity, religion, age, ancestry, disability, genetic information, military status, or veteran status, in the university's programs and activities as required by applicable laws and regulations. The person designated with responsibility for coordination of compliance efforts and receipt of inquiries concerning the nondiscrimination policy is the university's Title IX Coordinator: the Director of the Office of Institutional Equity, equity@k-state.edu, 103 Edwards Hall, 1810 Kerr Drive, Kansas State University, Manhattan, Kansas 66506-4801. Telephone: 785-532-6620 | TTY or TRS: 711. The campus ADA Coordinator is the Director of Employee Relations and Engagement, who may be reached at charlott@k-state.edu or 103 Edwards Hall, 1810 Kerr Drive, Kansas State University, Manhattan, Kansas 66506-4801, 785-532-6277 and TTY or TRS 711. Revised Aug. 29, 2017.

