What we do & *Why* it matters

Agricultural and Biological Engineering | abe.illinois.edu

The Department of Agricultural and Biological Engineering advances and integrates engineering, technology, and life sciences and develops human capacity to ensure abundant food supply, sustainable and innovative agriculture, and environmentally sustainable use of natural resources. The department is committed to creating an inclusive, diverse, and rewarding atmosphere for work and learning.

NESLIHAN AKDENIZ (clinical assistant professor) | *neslihan@illinois.edu*
Dr. Akdeniz works in the area of animal production. She finds ways to advance the utilization of agricultural by-products to make the best use of the nutrients and to enhance the long-term sustainability of the nation's agriculture. Her extension program focuses on promoting best management practices/rules and regulations for animal manure handling. One of her research goals is to prevent the spread of infectious animal diseases by improving the biosecurity of the animal mortality composting systems.

CODY ALLEN (assistant professor) | *allencm@illinois.edu*
Dr. Allen's research focuses on creating cleaner, more efficient heavy-duty machine systems. He explores new powertrain technologies and architectures that reduce non-renewable energy consumption and harmful emissions. He also develops vehicle control algorithms and validation tools to automate machine functions, resulting in improved operational productivity, efficiency, and safety.

RABIN BHATTARAI (associate professor) | *rbhatta2@illinois.edu*
Dr. Bhattarai develops engineering solutions to improve water quality and sustain crop production. He uses laboratory and field experiments, along with computer simulation models, to investigate how to balance water quality, nutrient management, and yield goals for a sustainable agricultural system.

GIRISH CHOWDHARY (associate professor and Donald Biggar Willet Faculty Fellow) | *girishc@illinois.edu*
Dr. Chowdhary's group is creating new robots, AI, and machine learning algorithms for agriculture, defense, and exploration. He believes robots that learn to do difficult tasks in harsh, uncertain, and dynamic environments are needed to tackle challenging problems, including high-throughput phenotyping, herbicide resistant weeds, labor shortage, and safe operation in contested areas.

MARIA CHU (associate professor) | *mlchu@illinois.edu*
Our quality of life depends significantly on the services or benefits that we get from our ecosystem like food, water, nutrient cycling, protection from flood, biodiversity, and recreation. Dr. Chu studies the impacts of climate and land use changes on the water- and soil-related ecosystem services.

RICHARD COOKE (professor) | *rcooke@illinois.edu*
Dr. Cooke is increasing the efficiency of drainage-related best management practices, and developing protocols for their design. He also develops techniques to simplify the extraction of elevation data from pulsed laser system (lidar) images, and creates rainfall harvesting systems to extend cropping into the dry season in Sierra Leone.

PAUL DAVIDSON (associate professor) | *pdavidso@illinois.edu*
Dr. Davidson improves and maintains surface water systems by reducing the transport of nutrients, pathogens, and pesticides from agricultural and urban systems to waterways. He works with farmers and other stakeholders to develop solutions that protect the quality of our water resources while maintaining efficient operations.

ANGELA GREEN-MILLER (associate professor) | *angelag@illinois.edu*
Dr. Green-Miller advances our understanding of animal welfare and husbandry issues in order to address production and sustainability challenges. Using a systematic "speaking animal" approach to explore the interactions of animals with their environment, she develops animal systems and management strategies to simultaneously manage the animals, the people, and the facility.

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TONY GRIFT (professor) | *grift@illinois.edu*
Dr. Grift develops high-throughput plant phenotyping and soil-sensing technologies that aid agriculture with efficiently reaching its production potential while minimizing its environmental impact. His aim is to help set humanity on a trajectory where it can feed itself sustainably, indefinitely, and from renewable sources alone.

JORGE GUZMAN (research assistant professor) | *jag@illinois.edu*
Dr. Guzman works on improving our understanding of surface and subsurface water interactions, including transport of sediment and pollutants under changing conditions. He combines data and computing to enhance and develop hydrologic and environmental models that assess the impacts of natural and anthropogenic stressors on agricultural production systems.

SALAH ISSA (assistant professor) | *salah01@illinois.edu*
Dr. Issa's research is focused on injury prevention through predictive science, evaluating new technologies and implementing technologies that reduce or remove hazards. Recognizing that agriculture ranks among the deadliest occupations with injury rates remaining fairly stable since 1990's, he is exploring new strategies in training, and prevention. This includes investigating the safety and health impacts of AI-based technologies, developing predictive models for grain entrapments, and utilizing VR technologies to develop immersive learning experiences for agricultural safety. His extension program focuses on agricultural injury trends in Illinois and promoting a culture of safety among Illinois farmers and grain industry workers.

PRASANTA KALITA (professor) | *pkalita@illinois.edu*
Dr. Kalita teaches and conducts research for efficient land & water resources management for environmental sustainability, ecosystem enhancement, and food security locally and globally. His research has developed best management practices (bmps) that have improved water quality by reducing nutrients, pesticides, microbial pathogens, and sediment transport into receiving waters. Dr. Kalita continues to develop strategies and guidelines for reducing water requirement for optimum food production and eliminating food loss and waste. His works have built institutional capacity and human resources for natural resources management and sustainable food production systems in many parts of the world.

MOHAMMED KAMRUZZAMAN (assistant professor) | *mkamruz1@illinois.edu*
Dr. Kamruzzaman applies optical sensing technologies such as spectroscopy and hyperspectral imaging in tandem with chemometrics and machine learning to address the sustainability of bioprocessing technologies to promote the sustainable use of renewable resources. He also works on novel and innovative process routes for rapid and real-time characterization and quality assessment/control of bioproducts/bioprocesses to improve food security, quality, safety, and nutrition, while simultaneously accounting for environmental and socio-economic impacts.

BRENDAN KUHNS (instructor) | *kuhns2@illinois.edu*
Mr. Kuhns is an Instructor for Technical Systems Management courses. Specifically he develops material and provides instruction for courses related to agricultural machinery and precision agriculture technology. His academic background involves work with soil sensing, precision agriculture technology, data intensive farm management, and mechatronics.

LAURIE LEONELLI (assistant professor) | *lbl@illinois.edu*
Dr. Leonelli integrates genomics, proteomics, and synthetic biology to engineer plants with improved photosynthesis. She investigates the natural diversity in photosynthetic enzymes from non-model and emerging model species to source materials for manipulating energy harvesting and dissipation in crops.

RONALDO MAGHIRANG (professor and head) | *ronaldom@illinois.edu*
Dr. Maghirang's research has focused on measurement, numerical simulation, and control of air quality. His current research deals with low-cost air pollution monitoring in communities, distribution and efficacy of insecticide sprays for control of stored-product insects in food storage and processing facilities, and mechanisms and mitigation of dust generation during grain handling and processing.

GOPU RAVEENDRAN NAIR (teaching assistant professor) | *gnair@illinois.edu*
Dr. Nair teaches Technical Systems Management courses. He specializes in the application of microwave, radio frequency and high electric field in the area of food and biomass processing.

KENT RAUSCH (associate professor) | *krausch@illinois.edu*
Modern grain processes create ingredients to help feed a growing population utilizing all components of the grain. Current processes produce a high-valued primary product with an assortment of low-valued coproducts. Dr. Rausch's work seeks to improve nutrient separations and energy efficiency so the resulting coproducts have a smaller environmental footprint and are better suited and more valuable to the end user.

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LUIS RODRIGUEZ (associate professor) | *lfr@illinois.edu*
Dr. Rodriguez specializes in biological system modeling, simulation, and analysis. He works to ensure that complex food and agricultural systems can operate efficiently, with minimal wastage, while managing costs for the benefit of both society and the environment.

JOSIE RUDOLPHI (assistant professor) | *josier@illinois.edu*
Agriculture ranks among the most stressful occupational industries. Dr. Rudolphi's research explores the association between stress and mental health, and identifies risk and protective factors for mental illness. She works to protect the health and safety of the agricultural workforce, including farm youth. Her extension programs use evidence-based methods to reduce the stigma and promote mental well-being among rural and agricultural communities.

VIJAY SINGH (professor, director of Integrated Bioprocessing Research Laboratory) | *vsingh@illinois.edu*
Dr. Singh focuses on science and engineering required to produce sustainable food, biofuels, and bioproducts. He develops novel, cost-effective bioprocessing technologies that improve recovery of chemical and phytochemical constituents from biological material and their conversion to higher value industrial products. Dr. Singh's recent research activities are at the nexus of plant biotechnology and bioprocessing and are leading the development of new technologies and renewable products in the industrial biotech space. In his role at IBRL, Dr. Singh provides leadership in developing industrial partnerships, bioprocess pilot-scale proof-of-concept activities and techno-economic analyses to facilitate commercialization of innovative technologies.

MEI TESSUM (research assistant professor) | *meitessum@illinois.edu*
Dr. Tessum's research focuses on estimating exposure and health impacts of agricultural air pollution in both environmental and occupational settings. She has expertise in aerosol sampling and control technology, ambient air quality monitoring strategy, spatial temporal air pollution exposure modeling, and health effects of air pollution. She currently studies statistical methods and machine learning applications for quantifying population-level air pollution exposures.

LEI TIAN (associate professor) | *lei-tain@illinois.edu*
Dr. Tian develops real-world precision and site-specific tools for industry and government agencies to use in agriculture and natural resources management. His research ranges from on-farm production uses such as weed control to large-scale agribusiness uses such as regional yield estimations.

CHRISTINA TUCKER (instructor) | *lyvers2@illinois.edu*
Dr. Tucker is an instructor teaching a variety of ABE and TSM courses. She develops material and provides instruction for courses related to HVAC, Environmental Systems, the Food Web, and to ABE. Her academic background involves work in animal welfare, systems thinking, and livestock environments.

XINLEI WANG (professor) | *xwang2@illinois.edu*
Dr. Wang develops creative engineering solutions to problems dealing with the environment and energy in biosystems that involve humans, plants and animals. He investigates renewable energy such as solar, wind, and geothermal energy and technologies that improve energy efficiency in building environment controls, agricultural production, and processes. He also studies how to control livestock production emissions for air quality improvement.

ANN-PERRY WITMER (lecturer) | *awitmer@illinois.edu*
Dr. Witmer examines the technical and societal contexts that determine whether an infrastructure intervention for non-industrialized communities can be made more effective and sustainable. Her Contextual Engineering research group seeks to inform technical design with the social sciences to create an engineered solution that not only is robust but also meets the specific needs of the people for whom it is designed. She also applies contextual thinking to the department's capstone course to encourage advanced ABE undergrads to identify and address client conditions in a design-based experience.

YUANHUI ZHANG (professor) | *yzhang1@illinois.edu*
Dr. Zhang advances hydrothermal processes of converting wet biomass into biocrude oil and biochemicals. The processes recover nutrients, treat the wastewater, and capture carbon dioxide. The biocrude is then upgraded into transportation fuel. He develops Volumetric Particle Tracking Velocimetry (VPTV) technology for fluid flow studies that can quantify profiles of velocity, acceleration, pressure, particulate transport fate, and air cleaning technologies.