**BIOLOGICAL SYSTEMS ENGINEERING**

**DEGREES/MAJORS, DOCTORAL MINORS, GRADUATE/PROFESSIONAL CERTIFICATES**

- Biological Systems Engineering, M.S. ([http://guide.wisc.edu/graduate/biological-systems-engineering/biological-systems-engineering-ms/](http://guide.wisc.edu/graduate/biological-systems-engineering/biological-systems-engineering-ms/))
- Biological Systems Engineering, Ph.D. ([http://guide.wisc.edu/graduate/biological-systems-engineering/biological-systems-engineering-phd/](http://guide.wisc.edu/graduate/biological-systems-engineering/biological-systems-engineering-phd/))

**PEOPLE**

**Professor Robert Anex**
- Biological systems analysis and assessment; life cycle assessment; techno-economic analysis

**Professor Christopher Choi**
- Heat and mass transfer and computational fluid dynamics (CFD); Controlled environments – livestock housing and greenhouse; water distribution system modeling and water quality; experimental methods, data acquisition, and systems optimization in biological systems

**Assistant Professor Matthew Digman**
- Impact of autonomy on agricultural machine forms; application of sensors to predict chemical and physical properties of agricultural materials

**Professor Sundaram Gunasekaran**
- Engineering properties and quality of food and biomaterials; rheology of food and other macromolecular systems and hydrogels; structure function relationships in foods; novel and value-added bioprocess engineering

**Professor K.G. Karthikeyan**
- Fate, removal, and transport of nutrients and contaminants in surface/subsurface environments; water quality chemistry; land application of agricultural/municipal/industrial waste; applications of GIS/water quality models; physical and chemical processes for water, wastewater, and waste treatment; soil decontamination

**Associate Professor Rebecca Larson**
- Biological waste; manure management; handling and treatment of agricultural and food processing waste; agricultural sustainability; land application of various waste streams, including runoff and leaching; waste-to-energy technologies, including biogas production from anaerobic digestion; composting

**Assistant Professor Brian Luck**
- Machine management, variable rate technology; agricultural “Big Data” management; remote sensing

**Professor Xuejun Pan**
- Development of innovative biorefining process for producing energy, fuels, chemicals, and materials from renewable resources (biomass) with specific research interests in pretreatment and fractionation of lignocellulosic biomass for bioconversion to chemicals and fuels; enzymatic and non-enzymatic saccharification of cellulose and lignocellulose; catalytic conversion of lignocellulose to drop-in hydrocarbon fuel; platform chemicals from biomass; functional materials from cellulose, lignin, hemicellulose, and extractives.

**Professor Douglas Reinemann**
- Biomechanics of machine milking; sustainable development of bio-energy systems; renewable energy technology and policy; biosensors for milk quality analysis; effects of the electrical environment on farm animals; integral thought and philosophy

**Associate Professor and Department Chair Troy Runge**
- Bioenergy – biomass composition impact on bioprocessing systems, including anaerobic digestion, composting, gasification, and catalysis; Biomaterials – pulp, paper, bio-based chemicals, cellulose composites and nonwoven structures

**Professor Kevin Shinners**
- Engineering aspects of systems to cut, dry, harvest, package, store, fractionate and process biological plant material to be used as ruminant animal feed or as a biomass feedstock for production of bio-energy and bio-products; sensors and sensor systems to measure machine performance and crop material properties for Precision Farming systems as applied to hay, forage, and bio-mass crops

**Professor John Shutske**
- Safety engineering and education related to occupational and public health hazards in agricultural and food systems; multidisciplinary approaches for solving complex risk-related problems; design and evaluation of sensors and control systems to mitigate environmental and machine risks; risk communication methods and limitations.

**Associate Professor Paul Stoy**
- Surface-atmosphere exchange; ecosystem ecology; natural resource management

**Professor Anita Thompson**
- Hydrologic implications of land use change; urban hydrology and stormwater management; water quality impacts of biofuel crop production; cold regions hydrology; hydrologic modeling; sediment, nutrient and pathogen transport; polyacrylamides and biosolids for fertilizer and erosion management

**Assistant Professor Zhou Zhang**
- Multi-source remote sensing data fusion (e.g., hyperspectral, LiDAR, RGB); machine learning for high dimensional data analysis; UAV-based imaging platform developments for precision agriculture; crop yield prediction using remote sensing and machine learning; high-throughput image-based plant phenotyping.
AFFILIATE FACULTY

Assistant Professor Grace Bulltail, Nelson Institute
Professor Mark Etzel, Dept. of Food Science
Professor Awad Hanna, Dept. of Civil Engineering
Professor Richard Hartel, Dept. of Food Engineering
Professor John Ralph, Dept. of Biochemistry