AGRICULTURAL ENGINEERING (AGEN)

AGEN 824 Machine Design in Agricultural Engineering
Crosslisted with: AGEN 424
Prerequisites: Senior standing; AGEN 324; and MECH 130
Description: Design of machine elements. Definition, analysis, and solution of a design problem in agricultural engineering.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option
Offered: FALL

AGEN 836 Embedded Controls for Agricultural Applications
Crosslisted with: AGEN 436, AGST 436, AGST 836
Prerequisites: AGEN/BSEN 260 or AGST 416
Description: Introduction to the basics of embedded controller programming, and the development of Controller Area Network (CAN) bus systems in agricultural applications. Interfacing sensors with analog and digital signals, closed loop control of actuators, transmission and reception of CAN messages, programming of CAN messages in a distributed controller set up for sensor data acquisition, and actuator control will be studied.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded
Offered: FALL

AGEN 841 Animal Waste Management
Crosslisted with: AGEN 441, BSEN 441, BSEN 841
Prerequisites: Senior standing.
Description: Characterization of wastes from animal production. Specification and design of collection, transport, storage, treatment, and land application systems. Air and water pollution, regulatory and management aspects.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

AGEN 846 Unit Operations of Biological Processing
Crosslisted with: BSEN 446, BSEN 846, AGEN 446
Prerequisites: AGEN/BSEN 225; and AGEN/BSEN 344
Description: Application of heat, mass, and moment transport in analysis and design of unit operations for biological and agricultural materials. Evaporation, drying, distillation, extraction, leaching, thermal processing, membrane separation, centrifugation, and filtration.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option
Offered: SPRING
Prerequisite for: BSEN 935

AGEN 853 Irrigation and Drainage Systems Engineering
Crosslisted with: AGEN 453, BSEN 453, BSEN 853
Prerequisites: CIVE 310 or MECH 310; AGEN 344 or BSEN 344.
Description: Analytical and design consideration of evapotranspiration, soil moisture, and water movement as related to irrigation and drainage systems; analysis and design of components of irrigation and drainage systems including water supplies, pumping plants, sprinkler systems, and center pivots.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option
Prerequisite for: AGEN 854, AGST 854; AGEN 953; AGST 855

AGEN 854 Irrigation Laboratory and Field Course
Crosslisted with: AGST 854
Prerequisites: AGEN 453/853, or AGST 452/852
Notes: Offered during the summer pre-session in even calendar years.
Description: A laboratory and field course which emphasizes irrigation water supply and distribution systems. Laboratory topics include performance of surface, sprinkler, and drip irrigation systems; pipeline hydraulics; flow in streams, canals, and irrigation pipelines; irrigation pumping systems; irrigation well hydraulics; and soil water properties. The field trip includes visits to irrigation water supply and hydroelectric power projects; water resources agencies; irrigation field research sites; and manufacturers and installers of agricultural irrigation systems.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded
Offered: SUMMER

AGEN 856 GIS and Ecohydrological Modeling for Natural Resources
Crosslisted with: BSEN 456, AGEN 456, BSEN 856
Prerequisites: AGEN/BSEN 350 or CIVE 351 or AGST 354 or NRES 453
Description: Use of GIS to create inputs to models such as HEC-HMS and SWAT. Processes to simulate hydrology and erosion in models. Development and calibration of models based on student's area of interest.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option
Offered: SPRING

AGEN 860 Instrumentation and Controls
Crosslisted with: AGEN 460, BSEN 460, BSEN 860
Prerequisites: ECEN 211 or ECEN 215 or AGEN/BSEN 260
Description: Analysis and design of instrumentation and controls for agricultural, biological, and biomedical applications. Theory of basic sensors and transducers, analog and digital electrical control circuits, and the interfacing of computers with instruments and controls. LabVIEW Programming. Emphasis on signal analysis and interpretation for improving system performance.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option
Offered: FALL

AGEN 889 Graduate Foundations I
Crosslisted with: BSEN 889
Description: Introduction into departmental and campus resources, professionalism, preparation and delivery of presentations, technical writing, and additional topics as arranged by enrolled students.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Grading Option: Grade Pass/No Pass Option
Prerequisite for: AGEN 989, BSEN 989

AGEN 892 Special Topics in Agricultural Engineering
Crosslisted with: AGEN 492
Prerequisites: Permission
Description: Subject matter in emerging areas of Agricultural Engineering not covered in other courses within the curriculum. Topics, activities, and delivery methods vary.
Credit Hours: 1-6
Min credits per semester: 1
Max credits per semester: 6
Max credits per degree: 6
Grading Option: Grade Pass/No Pass Option

AGEN 896 Special Problems
Crosslisted with: BSEN 896
Prerequisites: Permission
Description: Investigation and written report on engineering problems not covered in sufficient depth through existing courses. Topic varies by semester.
Credit Hours: 1-6
Min credits per semester: 1
Max credits per semester: 6
Max credits per degree: 6
Grading Option: Grade Pass/No Pass Option

AGEN 897 Masters Project
Crosslisted with: BSEN 897, AGST 897
Prerequisites: Admission to M.S. in Agricultural and Biological Systems Engineering or M.S. in Agricultural Systems Technology or M.S. in Mechanized Systems Management, and permission of major advisor
Notes: Intended for students who are pursuing an option B master's degree in Agricultural and Biological Systems Engineering, or Agricultural Systems Technology or Mechanized Systems Management.
Description: Conception, design, development, and completion of a project that requires data collection, synthesis, analysis of results, and the development of a final written report that will be defended in the final oral examination.
Credit Hours: 1-6
Min credits per semester: 1
Max credits per semester: 6
Max credits per degree: 6
Grading Option: Pass No-Pass

AGEN 898 Internship
Crosslisted with: BSEN 898
Prerequisites: Permission
Notes: Students required to write an internship report of their creative accomplishments after completion of the internship. Students may spend up to nine months at the cooperating partner¿s workplace.
Description: Solution of engineering or management problems through a non-academic experience within the private sector or a government agency. The experience entails all or some of the following: research, design, analysis, and testing on an engineering problem. A plan, which documents how the individual will demonstrate creativity during the internship must be approved prior to the internship.
Credit Hours: 1-6
Min credits per semester: 1
Max credits per semester: 6
Max credits per degree: 6
Grading Option: Grade Pass/No Pass Option

AGEN 899 Masters Thesis
Prerequisites: Admission to masters degree program and permission of major adviser
Credit Hours: 1-10
Min credits per semester: 1
Max credits per semester: 10
Max credits per degree: 99
Grading Option: Pass No-Pass

AGEN 923 Advanced Design in Agricultural Engineering
Prerequisites: Agricultural engineering or permission
Description: The use of theories of failure, fatigue, stress concentrations, shock and impact analysis in the design of machine members. Laboratory work includes an in-depth study of the testing and analysis of machine components.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

AGEN 930 Conservation Agriculture Systems
Crosslisted with: AGRI 930, NRES 930, BSEN 930
Prerequisites: Graduate student status.
Notes: Students entering the course should have a contextual understanding or background on the ecology of managed landscapes. The course is designed to build on students' scientific knowledge about the ecological functioning of agricultural landscapes by addressing the parallel influences of social, economic, and civil structures on agricultural system functioning, food security, cultural sovereignty, and environmental health.
Description: Aims to equip with an in-depth knowledge of conservation agriculture systems. Builds on scientific knowledge about the ecological functioning of agricultural landscapes by addressing the parallel influences of social, economic, and civil structures on agricultural system functioning, food security, cultural sovereignty, and environmental health. Explores the historical foundations, motivations, advances, and outcomes in global and local agricultural systems across time. Topics will focus on discovering ways scientific knowledge is correlated with historical occurrences and modern social perceptions. Content is selected to assist in developing multifaceted connections and clarity between their scientific understanding, the organization of agricultural systems, and the historical events that have influenced the development of modern food systems. Emphasis will be placed on harnessing individuals experiences and building discipline-based knowledge to prepare informed and perceptive agriculture science professionals with skills needed to strategically tackle modern agricultural production issues.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded
Offered: FALL

AGEN 941 Agricultural Waste Management
Crosslisted with: BSEN 941
Prerequisites: Permission
Description: Aerobic, anaerobic, and physical-chemical treatment, energy recovery and protein synthesis processes for high-strength organic materials; agricultural applications including composting, ammonia stripping, nitrification, denitrification, and land disposal of organic and chemically treated materials.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

AGEN 945 Resilience Design in Agriculture
Crosslisted with: AGRI 945, NRES 945, BSEN 945
Prerequisites: Graduate student status.
Description: This 3-credit, graduate-level course teaches practical approaches in designing, or redesigning, food systems to optimize resource use and enhance agriculture system resilience. Transdisciplinary approaches are applied in solution development by combining concepts of conservation agriculture, agroecology, biodynamic farming, biogeochemistry, permaculture, and biosystems engineering to plan, mediate, and regenerate food systems. Topics center on land mitigation and adaptation methods that protect and conserve natural resources, regenerate and advance agroecosystems, promote land investment, adapt infrastructure, reduce disaster risks and climate vulnerability, and promote value-added incentives for controlling waste and pollution. Investigative analyses focus on ways food production and consumption patterns affect social and environmental sustainability and modern agrifood supply chain influences the economic concepts of circularity and solidarity.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded
Offered: FALL

AGEN 950 International Applications of Conservation Agriculture
Crosslisted with: AGRI 950, NRES 950, BSEN 950
Prerequisites: Graduate student status or approval by the instructor.
Description: This 3-credit, graduate-level course examines agricultural systems located in diverse geographical locations across the globe. Select agriculture production systems will be individually investigated to understand the environmental history of the area, creation of active production practices, viability of current methods, and value-added benefits from adding enhanced conservation practices. Science-based development plans will be created for the agriculture systems explored, which will have targeted goals, project objectives, theories to change (opportunities, barriers, planned interventions), implementation strategies, and assessment indicators. Improvement plans for each agriculture system will prioritize conservation practices and reflect on economic strengths and limitations of the region, community considerations, and dietary needs of the local population. Agriculture systems examined will include a diverse grouping of large-scale and small-holder food and fiber systems in Africa, Asia, Australia, Europe, North America, and South America.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded
Offered: SPRING

AGEN 953 Advanced Irrigation and Drainage Systems Engineering
Prerequisites: AGEN 853, MATH 821
Description: Advanced analytical considerations of environmental aspects of soil-plant systems; movement of water in soils; water movement through plants; and irrigation and drainage systems for controlling water in the soil-plant environment.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

AGEN 954 Watershed Modeling
Prerequisites: BSEN/AGEN 350 & GEOG/NRES 312
Description: Modeling of runoff, sediment and nutrients of rural and urban watersheds with the Soil and Water Assessment Tool (SWAT), including model calibration, validation and uncertainty.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option
Offered: SPRING

AGEN 957 Modeling Vadose Zone Hydrology
Crosslisted with: BSEN 957, CIVE 957, GEOL 957
Prerequisites: MATH 221/821 or equivalent. AGEN/BSEN 350 or NRES 453/853 or equivalent.
Notes: Typically offered spring semester in even years.
Description: Principles and modeling of fluid flow and solute transport in the vadose zone. Topics include hydraulic properties of variably saturated media, application of Darcy's Law in variably saturated media, hydrologic and transport processes in the vadose zone, and solution of steady and unsteady flow problems using numerical techniques including finite element methods. Contemporary vadose zone models will be applied to engineering flow and transport problems. Review and synthesis of classic and contemporary research literature on vadose zone hydrology will be embedded in the course.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option
Offered: SPRING

AGEN 989 Graduate Foundations II
Crosslisted with: BSEN 989
Prerequisites: AGEN/BSEN 889
Description: Explore BSE career paths; identify necessary knowledge, skills, and abilities; and plan an aligned graduate experience. Become familiar with the professional norms and ethical principles and practices related to research. Build foundational skills for conducting a literature review. Develop oral communication skills appropriate for BSE. Develop reflexive ability to make meaning of graduate experiences.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Grading Option: Grade Pass/No Pass Option

AGEN 998 Advanced Topics
Crosslisted with: BSEN 998
Prerequisites: Permission
Description: Individual study in advanced engineering topics that are not covered in regular course work or thesis. Topic varies by term.
Credit Hours: 1-6
Min credits per semester: 1
Max credits per semester: 6
Max credits per degree: 6
Grading Option: Grade Pass/No Pass Option

AGEN 999 Doctoral Dissertation
Prerequisites: Admission to doctoral degree program and permission of supervisory committee chair
Credit Hours: 1-24
Min credits per semester: 1
Max credits per semester: 24
Max credits per degree: 99
Grading Option: Pass No-Pass