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/BSEN 225, AGEN/BSEN 260 or MSYM 416
Prerequisites: AGEN/BSEN 444, BSEN 446, AGEN 446
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, MSYM 854; AGEN 953

AGEN 854 Irrigation Laboratory and Field Course
Crosslisted with: MSYM 854
Prerequisites: AGEN 453/853, or MSYM 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 860 Instrumentation and Controls
Crosslisted with: AGEN 460, BSEN 460, BSEN 860
Prerequisites: ELEC 211 or ELEC 215.
Description: Analysis and design of instrumentation and controls for agricultural and biological production, management and processing. Theory of basic sensors and transducers, analog and digital electrical control circuits, and the interfacing of computers with instruments and controls. 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

AGEN 889 Seminar 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
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, MSYM 897
Prerequisites: Admission to M.S. in Agricultural and Biological Systems Engineering or M.S. in Mechanized Systems Management, and permission of major advisor
Notes: Intended for students who are pursuing an Option II or III master’s degree in Agricultural and Biological Systems Engineering, 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: 3-6
Min credits per semester: 3
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: Pass No-Pass Option

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: Pass No-Pass Option

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: 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: Pass No-Pass Option
Offered: SPRING
AGEN 955 Solute Movement in Soils  
**Crosslisted with:** AGRO 955, CIVE 955, GEOL 985  
**Prerequisites:** MATH 208; AGRO 861 or GEOL 888 or MSYM 852 or CIVE 858  
**Description:** Examination of the theory and experimental evidence available to characterize the movement of chemicals in soil. Both saturated and unsaturated flow conditions examined. Initial presentation of basic theoretical concepts. Remainder of class a discussion of the literature.  
**Credit Hours:** 3  
**Max credits per semester:** 3  
**Max credits per degree:** 3  
**Grading Option:** Grade Pass/No Pass Option

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 Seminar II  
**Crosslisted with:** BSEN 989  
**Description:** Developing a graduate program, orientation to research, grant and research proposal preparation, experimental design and analysis, manuscript preparation and review, preparations and delivery of technical presentations, and research management.  
**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