AGRICULTURAL ENGINEERING (AGEN)

AGEN 100 Introduction to Biological Engineering and Agricultural Engineering
Crosslisted with: BSEN 100
Description: Description of careers in biomedical, environmental, water resources, food and bioproducts, and agricultural engineering. The human, economic and environmental impacts of engineering in society. Communication, design, teamwork, and the role of ethics and professionalism in engineering work.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Format: LEC

AGEN 112 Computer-Aided Problem-Solving
Crosslisted with: BSEN 112
Prerequisites: MATH 106 or parallel
Description: Problem solving techniques and procedures through the use of Excel, MATLAB, and graphical methods. Emphasis on problem/solution communications with topics and problems from agricultural engineering and biological systems engineering.
Credit Hours: 2
Max credits per semester: 2
Max credits per degree: 2
Format: LEC
Offered: SPRING
Prerequisite for: BSEN 212A, AGEN 212A; BSEN 212B, AGEN 212B; BSEN 212E, AGEN 212E

AGEN 212A Computational Tools & Modeling for Agricultural & Biological Systems Eng: MATLAB
Crosslisted with: BSEN 212A
Prerequisites: AGEN/BSEN 112
Description: Introduction to tools needed to develop computation-intense solutions for a wide variety of problems relevant to agricultural and biological systems engineering. Advanced problem solving techniques are illustrated using examples of scripts.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Format: LEC
Offered: SPRING
Prerequisite for: BSEN 311; MECH 350

AGEN 212B Computational Tools & Modeling for Ag & Biological Sys Engr: Control Systems
Crosslisted with: BSEN 212B
Prerequisites: AGEN/BSEN 112.
Notes: This is a 5-week mini-course in which the lab time entails a combination of a 2nd lecture and followup laboratory applications.
Description: Introduction to microcontroller based embedded systems for agricultural and biological applications. Fundamental principles of microcontrollers and embedded systems through binary and hexadecimal number systems, digital logic, programming in integrated development environment, and microcontroller peripherals. Common agricultural and biological microcontroller input and output devices.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Format: LEC
Offered: SPRING

AGEN 212E Computational Tools & Modeling for Agricultural & Biological Systems Eng: LabVIEW
Crosslisted with: BSEN 212E
Prerequisites: AGEN/BSEN 112.
Description: Introduction to tools needed to develop computation-intense solutions for a wide variety of problems relevant to agricultural and biological systems engineering. Advanced problem solving techniques are illustrated using examples of scripts, simulation methods, graphical programming, and their combination.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Format: LEC
Offered: FALL/SPR

AGEN 225 Engineering Properties of Biological Materials
Crosslisted with: BSEN 225
Prerequisites: MATH 106
Description: Physical properties important to the design of harvesting, storage, and processing systems for agricultural crops; principles and techniques for measurement of properties including frictional effects, particle size, strength, moisture content, specific heat, and thermal conductivity.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Offered: SPRING
Prerequisite for: AGEN 324, BSEN 324; BSEN 416, BSEN 816; BSEN 446, BSEN 846, AGEN 446, AGEN 846

AGEN 303 Principles of Process Engineering
Crosslisted with: BSEN 303
Prerequisites: MATH 221.
Notes: MECH 310 or CIVE 310 or CHME 332 is recommended as prereq or parallel.
Description: Introduction to performance parameters and characteristics of pumps, fans, presses, and solids handling, size reduction, separation and agitation equipment. Application of the various technologies studied with analysis of example systems.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
AGEN 324 Mechanics of Materials for Agricultural and Biological Systems Engineering
Crosslisted with: BSEN 324
Prerequisites: AGEN/BSEN 225, MECH 223
Description: Development of the concepts of stress and strain relevant to agricultural and biological systems. Stress analysis of axial, torsional, and bending stresses, combined loading analysis, deflection evaluation, static and dynamic failure theory. Practical applications in agricultural and biological systems will be discussed.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: AGEN 424, AGEN 824; AGEN 443

AGEN 325 Power Systems Design
Crosslisted with: BSEN 325
Prerequisites: PHYS 212 or ELEC 211, and MECH/CIVE 310 or CHME 332 or parallel or permission.
Description: Fundamentals of Power systems for machines. Introduction to fluid power (hydraulics, pneumatics), pumps, motors, cylinders, control devices and system design. Selection of electric motors as power sources, operating characteristics and circuits. Selection of internal combustion engines as power sources.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

AGEN 344 Biological and Environmental Transport Processes
Crosslisted with: BSEN 344
Prerequisites: BSEN 244 or MECH 200; MATH 221; MECH/CIVE 310 or CHME 332 or parallel or permission.
Description: Introduction to concurrent transport of energy and mass in biological and environmental processes. Modes of heat transfer, steady and non-steady state heat conduction, convective heat transfer, radiative heat transfer, and heat transfer with phase change. Equilibrium, kinetics, and modes of mass transfer, diffusion, dispersion, and convective mass transfer. Soil freezing and thawing, energy and mass balances of crops, diffusivities of membranes, photosynthesis, human and animal energy balances, and respiration.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

AGEN 350 Soil and Water Resources Engineering
Crosslisted with: BSEN 350
Prerequisites: MATH 221; and parallel: MECH 310 or CIVE 310 or CHME 332
Description: Introduction to soil and water resources and the engineering processes used to analyze watersheds. Soil water relations, evapotranspiration, precipitation, runoff, erosion, flow in natural waterways and through reservoirs, wetland and groundwater hydrology, and water quality. Geographic information system utilized to develop maps and analyze watershed characteristics. A selected watershed is investigated.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

AGEN 395 Internship in Agricultural and Biological Systems Engineering
Crosslisted with: BSEN 395
Prerequisite for: AGEN 957, BSEN 957, CIVE 957, GEOL 957; BSEN 455, BSEN 855, CIVE 455, CIVE 855

AGEN 424 Machine Design in Agricultural Engineering
Crosslisted with: AGEN 824
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
Format: LEC

AGEN 431 Site-specific Crop Management
Crosslisted with: AGRO 431, MSYM 431
Prerequisites: Senior standing; AGRO/SOIL 153;AGRO 204; or permission.
Description: Principles and concepts of site-specific management. Evaluation of geographic information systems for crop production practices. Practical experience with hardware and software necessary for successful application of information affecting crop management.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Crosslisted with</th>
<th>Prerequisites</th>
<th>Description</th>
<th>Credit Hours</th>
<th>Max credits per semester</th>
<th>Max credits per degree</th>
<th>Format</th>
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<tbody>
<tr>
<td>AGEN 441</td>
<td>Animal Waste Management</td>
<td>AGEN 841, BSEN 441, BSEN 841</td>
<td>Senior standing</td>
<td>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.</td>
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<td>AGEN 443</td>
<td>Design of Light-Frame Structures</td>
<td>AGEN 324 or MECH 325 or parallel</td>
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<td>Engineering design for strength, economy, function and safety of light-frame structures; emphasis on wood, concrete, and steel elements; design project required.</td>
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<td>AGEN 445</td>
<td>Unit Operations of Biological Processing</td>
<td>BSEN 446, BSEN 846, AGEN 846</td>
<td>AGEN/BSEN 225; and AGEN/BSEN 344</td>
<td>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.</td>
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<td>AGEN 453</td>
<td>Irrigation and Drainage Systems Engineering</td>
<td>CIVE 310 or MECH 310; AGEN 344 or BSEN 344</td>
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<td>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.</td>
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<td>LAB</td>
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<td>AGEN 460</td>
<td>Instrumentation and Controls</td>
<td>AGEN 860, BSEN 460, BSEN 860</td>
<td>ELEC 211 or ELEC 215; or permission</td>
<td>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.</td>
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<td>LEC</td>
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**AGEN 470 Design I in Agricultural and Biological Systems Engineering**  
Crosslisted with: BSEN 470  
Prerequisites: Professional admission into AGEN or BSEN; and permission.  
Description: Definition, scope, analysis, and synthesis of a comprehensive design problem within the areas of emphasis in the Department of Biological Systems Engineering. Identification of a client's engineering problem to solve, and development of objectives and anticipated results.  
Credit Hours: 1  
Max credits per semester: 1  
Max credits per degree: 1  
Format: LEC

**AGEN 471 Search and Case Study**  
Crosslisted with: BSEN 471  
Prerequisites: Senior standing.  
Description: Exploration of a personalized engineering problem using the tools and techniques learned in previous courses.  
Credit Hours: 1  
Max credits per semester: 1  
Max credits per degree: 1  
Format: LEC

**AGEN 474 Advanced Design II**  
Crosslisted with: BSEN 474  
Prerequisites: BSEN/AGEN 470  
Description: Continuation of Design II, focusing on the development of advanced engineering solutions.  
Credit Hours: 3  
Max credits per semester: 3  
Max credits per degree: 3  
Format: LEC

**AGEN 480 Design II in Agricultural and Biological Systems Engineering**  
Crosslisted with: BSEN 480  
Prerequisites: BSEN/AGEN 470  
Description: Definition, scope, analysis, and synthesis of a comprehensive engineering problem in an engineering area of emphasis within the Department of Biological Systems Engineering. Design activity using the team approach to develop a solution.  
Credit Hours: 3  
Max credits per semester: 3  
Max credits per degree: 3  
Format: LAB

**AGEN 490 Independent Study**  
Crosslisted with: BSEN 490  
Prerequisites: Permission  
Notes: Topics vary.  
Description: Investigation and written report on engineering problems not covered in sufficient depth through existing courses.  
Credit Hours: 1-6  
Min credits per semester: 1  
Max credits per semester: 6  
Max credits per degree: 6  
Format: LEC

**AGEN 492 Special Topics in Agricultural Engineering**  
Crosslisted with: AGEN 892  
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  
Format: LEC

**AGEN 496 Independent Study**  
Crosslisted with: BSEN 496  
Prerequisites: Permission  
Notes: Topics vary.  
Description: Investigation and written report on engineering problems not covered in sufficient depth through existing courses.  
Credit Hours: 1-6  
Min credits per semester: 1  
Max credits per semester: 6  
Max credits per degree: 6  
Format: IND
AGEN 499H Honors Thesis

Crosslisted with: BSEN 499H

Prerequisites: Senior or junior standing, admission to the University Honors Program.

Description: Independent project which meets the requirements of the University Honors Program, conducted under the guidance of a faculty member in the Department of Biological Systems Engineering. The project should contribute to the advancement of knowledge in the field. Written thesis and formal presentation required.

Credit Hours: 1-6

Min credits per semester: 1

Max credits per semester: 6

Max credits per degree: 6

Format: IND