

# AGRICULTURAL ENGINEERING (AGEN)

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## 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

**Prerequisite for:** AGEN 324, BSEN 324

## AGEN 260 Instrumentation I for Agricultural and Biological Systems Engineering

**Crosslisted with:** BSEN 260

**Prerequisites:** MATH 221 or parallel

**Description:** Developing concepts in instrumentation relevant to agricultural and biological systems. Fundamental concepts of charge, current, voltage, impedance, power, and circuit analysis within the context of biological engineering. Introduction to sensors and their applications. Data collection using modern acquisition hardware and software. Electrical safety and effects of electricity on the human body.

**Credit Hours:** 3

**Max credits per semester:** 3

**Max credits per degree:** 3

**Format:** LEC

**Offered:** SPRING

**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 443

**AGEN 325 Power Systems Design**

**Crosslisted with:** BSEN 325

**Prerequisites:** PHYS 212 or ECEN 211, and MECH/CIVE 310 or CHME 332 or parallel.

**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

**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

**Offered:** FALL

**Prerequisite for:** AGEN 957, BSEN 957, CIVE 957, GEOL 957

**AGEN 395 Internship in Agricultural and Biological Systems Engineering**

**Crosslisted with:** BSEN 395

**Prerequisites:** Permission

**Description:** Practical experience, directed learning, and career exploration and development in a selected business, industry, agency, or educational institution. Activities must include a significant engineering component.

**Credit Hours:** 1-3

**Min credits per semester:** 1

**Max credits per semester:** 3

**Max credits per degree:** 3

**Format:** FLD

**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

**Offered:** FALL

**AGEN 431 Site-specific Crop Management**

**Crosslisted with:** AGRO 431, MSYM 431

**Prerequisites:** Senior standing; AGRO/SOIL 153;AGRO 204.

**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

**AGEN 436 Embedded Controls for Agricultural Applications****Crosslisted with:** MSYM 436, AGEN 836, MSYM 836**Prerequisites:** AGEN/BSEN 260 or MSYM 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**Format:** LEC**Offered:** FALL**AGEN 441 Animal Waste Management****Crosslisted with:** AGEN 841, 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**Format:** LEC**AGEN 443 Design of Light-Frame Structures****Prerequisites:** AGEN 324 or MECH 325 or parallel.**Description:** Engineering design for strength, economy, function and safety of light-frame structures; emphasis on wood, concrete, and steel elements; design project required.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Format:** LEC**AGEN 446 Unit Operations of Biological Processing****Crosslisted with:** BSEN 446, BSEN 846, AGEN 846**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**Format:** LEC**Offered:** SPRING**Prerequisite for:** BSEN 935**AGEN 453 Irrigation and Drainage Systems Engineering****Crosslisted with:** AGEN 853, 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**Format:** LEC**Prerequisite for:** AGEN 854, MSYM 854; AGEN 953**AGEN 460 Instrumentation and Controls****Crosslisted with:** AGEN 860, 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**Format:** LEC**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**Offered:** FALL/SPR**Prerequisite for:** AGEN 480, BSEN 480**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**ACE:** ACE 10 Integrated Product

**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