

AGRICULTURAL ENGINEERING

Description

Website: <http://agen.unl.edu/>

Agricultural engineering (AGEN) is one of two engineering degree programs offered in the Department of Biological Systems Engineering. AGEN students emphasize coursework in one of three engineering areas: machine design engineering, test engineering, or natural resources and irrigation engineering. Thus, some agricultural engineers are involved in the analysis and design of field machinery systems and machine components through the study of the principles of mechanical design, joining techniques, hydraulics, controls, ergonomics, and safety. Others are evaluating machine or mechanical system functional performance based on the study of test procedure standards, measurements, data acquisition, electronic communication and statistics, and practical experience gained at the Nebraska Tractor Test Laboratory. Still others are analyzing and designing soil and water management-related infrastructure and equipment as aided through study of related to natural resources management, irrigation, drainage, erosion, and runoff control techniques, and minimizing nonpoint-source pollution crop tillage and cultivation practices, and natural resources management. Job opportunities for graduates are available in industry, public agencies, consulting, and private practice.

The educational objectives of the agricultural engineering program are as follows: by three to five years after graduation, agricultural engineering graduates (whether they are involved in machine design, product, and performance testing, soil and water natural resources and irrigation, or other professional endeavors such as business or law) will be:

- Confidently using engineering skills in solving problems and providing design solutions in the context of agricultural systems.
- Continuing their professional development, and professional and community service through various opportunities provided by institutions, professional organizations, and other venues in an inclusive manner respecting diversity.
- Responsibly addressing issues of health and safety, ethics, and environmental impacts of engineering decisions in the context of agricultural systems.

The Department of Biological Systems Engineering is located in Chase Hall on East Campus. AGEN students participate in classes and laboratories on both the East and City Campuses. AGEN courses are offered on East Campus. Basic courses in math, chemistry, physics, engineering, computers, and electives in mechanical, civil, electrical, and chemical engineering are taken on City Campus. Convenient bus transportation is available between campuses.

Students benefit from small classes and personal acquaintances with faculty. In consultation with their advisor, students select electives that permit specialization in an emphasis area applicable to their career aspirations. Many students work part-time at the Nebraska Tractor Test Lab and on departmental research projects, gaining valuable experience for graduate study and future employment. Students also benefit from summer jobs, internships, and co-op programs. These opportunities give students practical experience to learn about careers in engineering. Students also gain valuable experience through participation in professional organizations such as the American Society of Agricultural and Biological Engineers, the UNL Soil and Water Resources Club, the

Quarter-Scale Tractor Club, the Fountain Wars Club, the Nebraska Society of Professional Engineers, and the Society for Women Engineers.

Major Department Admission

Pre-professionally admitted College of Engineering (COE) students majoring in agricultural engineering (AGEN) have their records examined for professional admission during the fall, spring, and summer immediately following the term in which:

- They have completed 43 credit hours applicable to the degree, including 6 hours of AGEN subject (prefix) coursework.
- Are enrolled in or have completed MECH 223.
- Have removed all admissions deficiencies, except they may be currently completing the last class to remove the foreign language deficiency.

Students must be professionally admitted in order to enroll in some upper-division courses, including AGEN 470.

To be professionally admitted to AGEN, the student must first meet the general professional admission criteria of the College of Engineering and not already have been denied admission by two other engineering majors or twice by the AGEN program, and have removed all admissions deficiencies within the first 30 hours of enrollment at Nebraska, except for the foreign language deficiency, which must be completed within the first 60 hours of enrollment at Nebraska.

- Students who meet the above criteria with a cumulative GPA of 2.8 or greater will be professionally admitted without further review.
- Students with a cumulative GPA of at least 2.5 but less than 2.8 will have their record reviewed by Department faculty for a decision of professional admission, conditional professional admission, or denial of professional admission.
- Students with a cumulative GPA less than 2.5 will be denied professional admission to the AGEN program.

Students who have been denied admission to the AGEN program once, and not also been denied admission to another engineering program, may continue taking courses in the AGEN program and will be reconsidered for professional admission again the next term. Students who have twice been denied professional admission to the AGEN program are not allowed to continue in the program.

The Department faculty may recommend conditional admission and specify deficiencies and performance criteria to transition out of conditional status. If a student has not met the professional admission criteria and has not, in the opinion of the Department faculty demonstrated a minimum standard of good professional judgment in the pursuit of their academic program as expected of degreed engineers, they may be denied professional admission to the degree program. The student may appeal this decision to the biological systems engineering department head and then, if necessary, to the College of Engineering Curriculum and Academic Standards Committee.

ACE Requirements

All students must fulfill the Achievement-Centered Education (ACE) requirements. Information about the ACE program may be viewed at <https://ace.unl.edu/>.

The minimum requirements of the AGEN program include courses involving ACE outcomes 1, 2, 3, 4, 8, and 10. Students should work with their advisor to select courses that satisfy ACE outcomes 5, 6, 7, and 9.

College Requirements

College Admission

College Entrance Requirements

Students must have high school credit for (one unit is equal to one high school year):

1. Mathematics – 4 units: 2 of algebra, 1 of geometry, and 1 of precalculus and trigonometry
2. English – 4 units
3. Natural sciences – 3 units that must include 1 unit of physics and 1 unit of chemistry (chemistry requirement waived for students in construction management or computer science)
4. Foreign language – 2 units of a single foreign language
5. Social studies – 3 units
6. Students having a composite ACT score of 28 or greater (or equivalent SAT score) will be admitted to the College of Engineering even if they lack any one of the following: trigonometry, chemistry, or physics. Students without test scores who are missing a full unit of trigonometry/pre-calculus/calculus or chemistry or physics will be evaluated through College Review.
7. Students having an ACT score of 19 or less in English (or equivalent SAT score) or a grade lower than B in high school English, must take ENGL 150 Writing and Inquiry or ENGL 151 Writing and Argument.

A total of 16 units is required for admission.

Engineering requires that student performance meet one of the following standards: composite ACT of 24, SAT of 1180, ACT Math subscore of 24, SAT Math subscore of 580, or a 3.5 cumulative GPA.

Any domestic first-year student who does not gain admission to Engineering but does gain admission to the University of Nebraska-Lincoln (UNL) will be reviewed through College Review. College Review is conducted through the College Review Committee which considers factors beyond standardized testing. Any first-year student who is not admitted through college review is placed in Pre-Engineering (PENG) with the Exploratory and Pre-Professional Advising Center (Explore Center). Students in the Explore Center can transfer to the College of Engineering once college admission requirements are met.

Students for whom English is not their language of nurture must meet the minimum English proficiency requirements of the University.

Students who lack entrance units may complete precollege training by Independent Study through the University of Nebraska–Lincoln Office of On-line and Distance Education, in summer courses, or as a part of their first or second semester course loads while in the Explore Center or other colleges at UNL.

Students should consult their advisor, their department chair, or Engineering Student Services (ESS) if they have questions on current policies.

Other Admission Requirements

Students who transfer to the University of Nebraska–Lincoln from other accredited colleges or universities and wish to be admitted to the College of Engineering (COE) must meet COE first-year student entrance requirements, have a minimum cumulative GPA of 2.5, and be calculus-

ready. Students not meeting either of these requirements must enroll in the Explore Center or another University college until they meet COE admission requirements. Students transferring from UNO, UNL, or UNK to the College of Engineering must be in good academic standing with their institution.

The COE accepts courses for transfer for which a C or better grade was received. Although the University of Nebraska–Lincoln accepts D grades from the University of Nebraska Kearney and the University of Nebraska Omaha, not all majors in the COE accept such low grades. Students must conform to the requirements of their intended major and, in any case, are strongly encouraged to repeat courses with a grade of C- or less.

Students who were previously admitted to COE and are returning to the College of Engineering must demonstrate a cumulative GPA of 2.5 to be readmitted to COE.

College Degree Requirements

Grade Rules

Grade Appeals

In the event of a dispute involving any college policies or grades, the student should appeal to their instructor, and appropriate department chair or school director (in that order). If a satisfactory solution is not achieved, the student may appeal their case through the College Academic Appeals Subcommittee.

Catalog Rule

Students must fulfill the requirements stated in the catalog for the academic year in which they are first admitted at the University of Nebraska–Lincoln. In consultation with advisors, a student may choose to follow a subsequent catalog for any academic year in which they are admitted to and enrolled as a degree-seeking student at Nebraska in the College of Engineering. Students must complete all degree requirements from a single catalog year. The catalog which a student follows for degree requirements may not be more than 10 years old at the time of graduation.

Students who have transferred from a community college may be eligible to fulfill the requirements as stated in the catalog for an academic year in which they were enrolled at the community college prior to attending the University of Nebraska-Lincoln. This decision should be made in consultation with the student's College of Engineering academic advising team (e.g., ESS professional advisor and the chief faculty advisor for the student's declared degree program). The chief faculty advisor has the final authority for this decision. Eligibility is based on a) enrollment in a community college during the catalog year the student wishes to utilize, b) maintaining continuous enrollment of at least 12 credit hours per semester at the previous institution for at least 2 semesters, and c) continuous enrollment at the University of Nebraska-Lincoln within 1 calendar year from the student's last term at the previous institution. Students must complete all degree requirements from a single catalog year and within the timeframe allowable for that catalog year.

Learning Outcomes

Graduates of the agricultural engineering program will have:

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety,

and welfare, as well as global, cultural, social, environmental, and economic factors.

3. An ability to communicate effectively with a range of audiences.
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

The above student outcomes have been approved by the ABET Engineering Area Delegation for use beginning with the 2019-20 academic year, and have been adopted by the faculty of the Department of Biological Systems Engineering.

Major Requirements

Specific Major Requirements

First Semester

AGEN 100 / BSEN 100	Introduction to Biological Engineering and Agricultural Engineering	1
CHEM 109A & CHEM 109L	General Chemistry I and General Chemistry I Laboratory	4
CSC 155N	Computer Science I: Engineering and Science Focus	3
ENGR 10	Freshman Engineering Seminar	0
MATH 106	Calculus I	5

Leadership Communication Elective

Select one of the following:		3
ALEC 102	Interpersonal Skills for Leadership	
COMM 210	Communicating in Small Groups	
COMM 286	Business and Professional Communication	
ENGR 100	Interpersonal Skills for Engineering Leaders (recommended)	

Credit Hours Subtotal: 16

Second Semester

AGEN 112 / BSEN 112	Computer-Aided Problem-Solving	2
CHEM 110A & CHEM 110L	General Chemistry II and General Chemistry II Laboratory	4
MATH 107	Calculus II	4

Agricultural or Biological Sciences Elective

Select one of the following		3-4
PLAS 153 / SOIL 153	Soil Resources	

ACE Elective:

Select one course from not yet satisfied ACE outcomes 5, 6, 7, or 9	3
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Credit Hours Subtotal: 16

Third Semester

AGEN 225 / BSEN 225	Engineering Properties of Biological Materials	3
ENGR 20	Sophomore Engineering Seminar	0
JGEN 200	Technical Communication I	3
MATH 208	Calculus III	4
AGST 232	Power and Machinery Principles	3
PHYS 211	General Physics I	4
Credit Hours Subtotal:		17

Fourth Semester

AGEN 260 / BSEN 260	Instrumentation I for Agricultural and Biological Systems Engineering	3
MATH 221	Differential Equations	3
MECH 223	Engineering Statics	3
PHYS 212	General Physics II	4

ACE Elective:

Select one course from not yet satisfied ACE outcomes 5, 6, 7, or 9	3	
Credit Hours Subtotal:		16

Fifth Semester

AGEN 324 / BSEN 324	Mechanics of Materials for Agricultural and Biological Systems Engineering	3
AGEN 460 / BSEN 460	Instrumentation and Controls	3
MECH 200	Engineering Thermodynamics	3
BSEN 130 or MECH 130	Computer-Aided Design Introduction to CAD	2
CIVE 310 or MECH 310	Fluid Mechanics Fluid Mechanics	3
Credit Hours Subtotal:		14

Sixth Semester

AGEN 325 / BSEN 325	Power Systems Design	3
AGEN 344 / BSEN 344	Biological and Environmental Transport Processes	3
BSEN 206	Engineering Economics	3
STAT 380 or MECH 321	Statistics and Applications Engineering Statistics and Data Analysis	3
MECH 373	Engineering Dynamics	3
Credit Hours Subtotal:		15

Seventh Semester

AGEN 424	Machine Design in Agricultural Engineering	3
AGEN 453 / BSEN 453	Irrigation and Drainage Systems Engineering	3
AGEN 470 / BSEN 470	Design I in Agricultural and Biological Systems Engineering	1

Emphasis Elective:

Select 6 hours	6
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ACE Elective:

Select one course from not yet satisfied ACE outcomes 5, 6, 7, or 9	6
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Credit Hours Subtotal: 19

Eighth Semester

AGEN 303	Principles of Process Engineering	3
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AGEN 480 / BSEN 480	Design II in Agricultural and Biological Systems Engineering	3
<i>Emphasis Elective:</i>		
Select 6 hours		6
<i>ACE Elective:</i>		
Select one course from not yet satisfied ACE outcomes 5, 6, 7, or 9		
Credit Hours Subtotal:		12
Total Credit Hours		125

AGEN Primary Emphasis Area Requirements

An emphasis area requires nine (9) hours.

Natural Resource & Irrigation Engineering

AGEN 350 / BSEN 350	Natural Resources Engineering	3
Select one of the following: 3		
AGEN 441 / BSEN 441	Animal Waste Management	
BSEN 455 / CIVE 455	Nonpoint Source Pollution Control Engineering	
BSEN 458 / CIVE 458	Groundwater Engineering	
<i>STEM Elective</i>		
Select 3 hours of the following: 3		
AGEN 441 / BSEN 441	Animal Waste Management	
AGEN 492	Special Topics in Agricultural Engineering	
AGEN 496	Independent Study	
BSEN 321 / CIVE 321	Principles of Environmental Engineering	
BSEN 355	Introduction to Ecological Engineering	
BSEN 422 / CIVE 422	Pollution Prevention: Principles and Practices	
BSEN 455 / CIVE 455	Nonpoint Source Pollution Control Engineering	
BSEN 458 / CIVE 458	Groundwater Engineering	
BSEN 468 / NRES 468 / WATS 468	Wetlands	
CHME 330	Chemical Engineering Laboratory I	
CHME 489	Air Pollution, Assessment and Control	
CIVE 102	Geomatics for Civil Engineering	
CIVE 310L	Hydraulics Laboratory	
CIVE 331	Introduction to Geotechnical Engineering	
CIVE 452	Water Resources Development	
CIVE 454	Hydraulic Engineering	
CIVE 456	Surface Water Hydrology	
MATH 314	Linear Algebra	
NRES 220	Principles of Ecology	
Total Credit Hours		9

Machine Design Engineering

MATH 314	Linear Algebra	3
MECH 342	Kinematics and Dynamics of Machinery	3
MECH 350	Introduction to Dynamics and Control of Engineering Systems	3
Total Credit Hours		9

Test Engineering

AGEN 431 / AGST 431 / PLAS 431	Site-specific Crop Management	3
AGST 433	Equipment and Tractor Testing	3
<i>STEM Elective</i>		
Select 3 hours of the following: 3		
AGEN 436 / AGST 436	Embedded Controls for Agricultural Applications	
AGEN 492	Special Topics in Agricultural Engineering	
AGEN 496	Independent Study	
ECEN 220	Introduction to Embedded Systems	
ECEN 460	Labview Programming	
MECH 330	Mechanical Engineering Analysis	
MECH 342	Kinematics and Dynamics of Machinery	
MECH 350	Introduction to Dynamics and Control of Engineering Systems	
MECH 380	Mechanical Engineering Measurements	
MECH 452	Experimental Stress Analysis I	
MECH 453	Robotics: Kinematics and Design	
MECH 457	Mechatronic Systems Design	
Total Credit Hours		9

Additional Major Requirements

Written Communications Requirement

Six (6) hours of English composition (e.g., two of ENGL 150, ENGL 151, ENGL 254) may be substituted for the written communications requirement (JGEN 200) in the agricultural engineering program.

Grade Rules

C- and D Grades

A grade of C or better is required for all agricultural engineering required courses and electives that are to count toward graduation, with the exception of ACE 5, 6, 7, and 9 electives.

Catalog To Use

In addition to the "Catalog Rule" of the College of Engineering, students transferring into the Department of Biological Systems Engineering must follow the catalog in effect at the time of their transfer into the department.

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**Grading Option:** Graded with Option**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**Grading Option:** Graded with Option**Offered:** SPRING**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**Grading Option:** Graded with Option**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**Grading Option:** Graded**Offered:** SPRING**Prerequisite for:** AGEN 325, BSEN 325**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**Grading Option:** Graded with Option**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**Grading Option:** Graded**Prerequisite for:** AGEN 443**AGEN 325 Power Systems Design****Crosslisted with:** BSEN 325**Prerequisites:** PHYS 212 or ECEN 211 or AGEN/BSEN 260, and MECH/CIVE 310 or CHME 332 or parallel, and professionally admitted engineering student.**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**Grading Option:** Graded**Offered:** SPRING**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**Grading Option:** Graded with Option

AGEN 350 Natural 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**Grading Option:** Graded with Option**Offered:** FALL**Prerequisite for:** ENVE 401**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**Grading Option:** Graded with Option**Offered:** FALL**AGEN 431 Site-specific Crop Management****Crosslisted with:** PLAS 431, AGST 431**Prerequisites:** Senior standing; PLAS/SOIL 153; PLAS 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**Grading Option:** Graded with Option**AGEN 436 Embedded Controls for Agricultural Applications****Crosslisted with:** AGST 436, AGEN 836, 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 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**Grading Option:** Graded with Option**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**Grading Option:** Graded with Option**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**Grading Option:** Graded with Option**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**Grading Option:** Graded with Option**Prerequisite for:** AGEN 854, AGST 854; AGEN 953**AGEN 460 Instrumentation and Controls****Crosslisted with:** AGEN 860, 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:** Graded with Option**Offered:** FALL

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**Grading Option:** Graded with Option**Offered:** FALL/SPR**Prerequisite for:** BSEN 480, AGEN 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**Grading Option:** Graded with Option**Offered:** SPRING**ACE:** ACE 10 Integrated Product**Experiential Learning:** Case/Project-Based Learning**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**Grading Option:** Graded with Option**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**Grading Option:** Graded with Option**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**Grading Option:** Graded**PLEASE NOTE**

This document represents a sample 4-year plan for degree completion with this major. Actual course selection and sequence may vary and should be discussed individually with your college or department academic advisor. Advisors also can help you plan other experiences to enrich your undergraduate education such as internships, education abroad, undergraduate research, learning communities, and service learning and community-based learning.

Career Information

The following represents a sample of the internships, jobs and graduate school programs that current students and recent graduates have reported.

Jobs of Recent Graduates

- Engineering Development Program-Product Engineer, John Deere - Cedar Falls, IA
- Production Engineer, Kawasaki Motors Manufacturing - Lincoln, NE
- Associate Engineer, Altec Industries - St. Joseph, MO
- Grain Terminal Operations, Archer Daniels Midland - Decatur, IL
- Manufacturing Engineer, CNH Industrial - Grand Island, NE
- Production Supervisor, Cargill - Holdrege, NE
- Design Engineer, Claas - Omaha, NE
- Test Development Engineer, Exmark Manufacturing - Beatrice, NE
- Design Engineer, Kuhn Krause - Hutchinson, KS
- Water Resources Project Engineer, JEO Consulting Group - Lincoln, NE
- Project Engineer, Lincoln Industries - Lincoln, NE
- Engineer, Industrial Irrigation - Hastings, NE
- Design Engineer, Orthman Manufacturing - Lexington, NE
- Product Improvement Engineer, Hagie Manufacturing - Clarion, IA
- FieldNET Water Management Support, Lindsay Corporation - Omaha, NE
- Design Engineer, Blue Ox - Lincoln, NE
- Research and Development, Marshall Engines - Kearney, NE
- Operational Engineer, Archer Daniels Midland - Columbus, NE
- Design Engineer, Allmand Brothers - Holdrege, NE
- Quality Engineer, John Deere - Waterloo, IA
- Service Engineer, Valmont Industries - Omaha, NE
- Irrigation Engineer, Wish-Nebraska - Ulysses, NE
- On-Site Project Engineer, CL Construction - Wahoo, NE
- Design and Sales Engineer, QC Supply - Schuyler, NE
- Design Engineer, Excel Industries - Hesston, KS

Internships

- Biological Research Assistant, USDA - Lincoln, NE
- Drivetrain Product Engineering Intern, John Deere - Waterloo, IA
- Agricultural Engineering Co-op, The Michigan Urban Farming Initiative - Detroit, MI
- R&D Engineering Intern, Global Industries - Grand Island, NE
- Field Test Technician, Claas - Omaha, NE
- Intern, Southwestern Company - Nashville, TN
- Combine Header Platform Intern, CNH Industrial - New Holland, PA
- Engineering Intern, JEO Consulting - Lincoln, NE
- Project Intern, Bartlett Grain Company - Kansas City, MO
- Test Engineer, AGCO - Jackson, MN
- Engineer Intern, Orthman Manufacturing - Lexington, NE
- Intern, NECO - Omaha, NE
- Tactical Sales Intern, John Deere - Ottumwa, IA
- Production Intern, Monsanto - Beaman, IA
- Water Resources Intern, Flatwater Group - Lincoln, NE
- Field Test Technician, Claas of America - Omaha, NE
- Agricultural Engineering Intern, Animal Science Dept, University of Nebraska-Lincoln - Lincoln, NE
- Design Engineering Intern, AGCO Corporation - Hesston, KS
- Environmental Engineering Intern, Nucor Steel - Norfolk, NE
- Grain Operations Intern, Barlett Grain Co. - Kansas City, MO
- Corn Header Design Engineering Intern, CNH Industrial - Mt. Joy, IA
- Engineering Intern, Cargill - Beardstown, IL

Graduate & Professional Schools

- Master's in Agricultural and Biosystems Engineering, University of Nebraska-Lincoln - Lincoln, NE
- Master's in Science, University of Nebraska-Lincoln - Lincoln, NE
- Ph.D., Electrical Engineering, University of Texas at Austin - Austin, TX