

# 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, test, or soil and water resources. Thus, some agricultural engineers are involved in the analysis and design of field machinery systems and machine components through 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 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 as aided through study of irrigation, drainage, erosion and runoff control techniques, 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 two to six years after graduation, agricultural engineering graduates (whether they are involved in machine design, product and performance testing, soil and water resources, or other professional endeavors such as business or law) will be:

- Applying their unique educational backgrounds in agricultural engineering by providing appropriate solutions to problems and adding value to the research, development, and design processes encountered in a variety of work environments.
- Considering systems as a whole when solving problems, looking beyond components and subsystems individually.
- Confidently using the necessary elements of mathematics, statistics, physical science, engineering, computer-based measurement and analysis tools, and current literature in solving problems and providing design solutions.
- Successfully integrating technical knowledge with organizational, listening, communication, and interpersonal skills to lead and work effectively in teams, and respectfully articulating the role of engineering decisions in the workplace, community, and world.
- Responsibly addressing issues such as health and safety, personal and professional ethics, and cultural diversity, as well as the social, environmental, and global impacts of their work.
- Continuing their personal growth, professional development, and professional and community service, through various opportunities provided by institutions, professional organizations, and other venues.

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 Soil and Water Resources 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 Design I in Agricultural and Biological Systems Engineering.

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 [ace.unl.edu](https://catalog.unl.edu/undergraduate/engineering/agricultural/ace.unl.edu) (<https://catalog.unl.edu/undergraduate/engineering/agricultural/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)
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.
7. Students having an ACT score of 19 or less in English (or equivalent SAT score) must take ENGL 150 Writing and Inquiry or ENGL 151 Writing and Argument.

A total of 16 units is required for admission.

Students must have an ACT (enhanced) score of 24 or greater (or equivalent SAT). Students who lack entrance requirements may be admitted based on ACT scores, high school rank and credits, or may be admitted to pre-engineering status in the Exploratory and Pre-Professional Advising Center. Pre-engineering students are advised within the Exploratory and Pre-Professional Advising Center.

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 Exploratory and Pre-Professional Advising Center or other Colleges at Nebraska.

Students should consult their advisor, their department chair, or Engineering Student Services 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 freshman entrance requirements and 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 at Kearney and at 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.

All transfer students must adopt the curricular requirements of the undergraduate catalog current at the time of transfer to the COE—not that in use when they entered the University of Nebraska–Lincoln. Upon admission to Nebraska, students wishing to pursue degree programs in the COE will be classified and subject to the policies defined in the subsequent section.

Students who were previously admitted to COE and are returning to the College of Engineering must demonstrate a cumulative GPA of 2.5 in order 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 his/her instructor and appropriate department chair or school director (in that order). If a satisfactory solution is not achieved, the student may appeal his/her case through the College Academic Appeals Committee on his/her campus.

## 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.

## 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 109	General Chemistry I	4
ENGR 10	Freshman Engineering Seminar	0
MATH 106	Calculus I	5
CSCE 155N	Computer Science I: Engineering and Science Focus	3

#### 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 110	General Chemistry II	4
MATH 107	Calculus II	4

#### Agricultural or Biological Sciences Elective

Select one of the following		3-4
AGRO 131	Plant Science	
AGRO 153	Soil Resources	
BIOS 101 & BIOS 101L	General Biology and General Biology Laboratory	
LIFE 120 & LIFE 120L	Fundamentals of Biology I and Fundamentals of Biology I laboratory	

#### ACE Elective:

Select one course from not yet satisfied ACE outcomes 5, 6, 7, or 9 3

Credit Hours Subtotal: 16

#### Third Semester

AGEN 225 / BSEN 225	Engineering Properties of Biological Materials	3
ENGR 20	Sophomore Engineering Seminar	0

MATH 208	Calculus III	4
JGEN 200	Technical Communication I	3
MSYM 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
PHYS 212	General Physics II	4
MECH 223	Engineering Statics	3

#### 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
MECH 130	Introduction to CAD	3
MECH 373	Engineering Dynamics	3
MECH 200	Engineering Thermodynamics	3

#### ACE Elective:

Select one course from not yet satisfied ACE outcomes 5, 6, 7, or 9 3

Credit Hours Subtotal: 15

#### Sixth Semester

AGEN 303 / BSEN 303	Principles of Process Engineering	3
AGEN 325 / BSEN 325	Power Systems Design	3
AGEN 344 / BSEN 344	Biological and Environmental Transport Processes	3
BSEN 206	Engineering Economics	3
CIVE 310 / MECH 310	Fluid Mechanics	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
AGEN 460 / BSEN 460	Instrumentation and Controls	3
MECH 321 or STAT 380	Engineering Statistics and Data Analysis Statistics and Applications	3

#### Emphasis Elective:

Select 3 hours 3

Credit Hours Subtotal: 16

#### Eighth Semester

AGEN 480 / BSEN 480	Design II in Agricultural and Biological Systems Engineering	3
---------------------	--	---

#### ACE Electives:

Select one course from not yet satisfied ACE outcomes 5, 6, 7, or 9	3
<i>Emphasis Elective:</i>	
Select 6 hours	6
Credit Hours Subtotal:	12
Total Credit Hours	123

## AGEN Primary Emphasis Area Requirements

An emphasis area requires 9 hours.

### Soil and Water Resources Engineering

AGEN 350 / Soil and Water Resources Engineering BSEN 350	3
---	---

Select one of the following: 3

AGEN 441 / Animal Waste Management  
BSEN 441

BSEN 455 / Nonpoint Source Pollution Control  
CIVE 455 Engineering

BSEN 458 / Groundwater Engineering  
CIVE 458

#### STEM Elective

Select 3 hours of the following: 3

AGEN 441 Animal Waste Management

AGEN 492 Special Topics in Agricultural Engineering

AGEN 496 Independent Study

BSEN 326 Introduction to Environmental Engineering

BSEN 355 Introduction to Ecological Engineering

BSEN 422 Pollution Prevention: Principles and Practices

BSEN 455 Nonpoint Source Pollution Control  
Engineering

BSEN 458 Groundwater Engineering

BSEN 468 Wetlands

CHME 330 Chemical Engineering Laboratory I

CHME 489 Air Pollution, Assessment and Control

CIVE 221 Geometric Control Systems

CIVE 319 Hydraulics Laboratory

CIVE 334 Introduction to Geotechnical Engineering

CIVE 452 Water Resources Development

CIVE 454 Hydraulic Engineering

CIVE 456 Surface Water Hydrology

GEOG 412 Introduction to Geographic Information  
Systems

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 / Site-specific Crop Management	3
--	---

AGRO 431 /

MSYM 431

MSYM 433 Equipment and Tractor Testing	3
--	---

#### STEM Elective

Select 3 hours of the following: 3

AGEN 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 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**Grading Option:** Graded with Option**Offered:** FALL**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**Grading Option:** Graded**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:** 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**Grading Option:** Graded with Option**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**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, 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**Grading Option:** Graded with Option**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:** 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**Grading Option:** Graded with Option**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**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 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
- Masters of Science, University of Nebraska-Lincoln - Lincoln NE
- Ph.D. Electrical Engineering, University of Texas at Austin - Austin TX

## **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
- Agricultural Engineering Co-op, Altec - St. Joseph MO
- 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
- Agricultural Engineering Co-op, Farm King - Salem SD
- Field Test Technician, Claas of America - Omaha NE
- Agricultural Engineering Intern, UNL Department of Animal Science - 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
- Agricultural Engineering Co-op, Sage Ag Inc. - Ankeny IA
- Engineering Intern, Cargill - Beardstown IL
- Intern, Southwestern Company - Nashville TN
- Water Resources Intern, Flatwater Group - Lincoln NE
- Corn Header Design Engineering Intern, CNH Industrial - Mt. Joy IA

## **Graduate & Professional Schools**

- Masters of Science in Agricultural and Bio Systems Engineering, University of Nebraska-Lincoln - Lincoln NE