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, AGEN 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 to respectfully articulate the role of engineering decisions in the workplace, community, and world;
- responsibly addressing issues such as health and safety, personal and professional ethics, cultural diversity, as well as the social, environmental, and global impacts of their work; and
- 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 the East Campus. Basic courses in math, chemistry, physics, engineering, computers, and electives in mechanical, civil, electrical, and chemical engineering are taken on the 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 have their records examined for advancement to professionally admitted status during the fall, spring, and summer immediately following the term in which 43 hours applicable to the degree including 6 hours of AGEN subject (prefix) coursework have been completed, and are enrolled in or have completed MECH 223, and 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 (i.e., completion of at least one semester in the College, a cumulative GPA of 2.5 or greater, completion of at least 43 hours applicable to the degree, and not already 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 by Department faculty. 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, provisional 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 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 provisional admission and specify deficiencies and performance criteria to transition out of provisional 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.
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, 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 College of Engineering.

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 and practice 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

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGEN 100 /</td>
<td>Introduction to Biological Engineering and</td>
<td>1</td>
</tr>
<tr>
<td>BSEN 100</td>
<td>Agricultural Engineering</td>
<td></td>
</tr>
<tr>
<td>CHEM 109</td>
<td>General Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>ENGR 10</td>
<td>Freshman Engineering Seminar</td>
<td>0</td>
</tr>
<tr>
<td>MATH 106</td>
<td>Calculus I</td>
<td>5</td>
</tr>
<tr>
<td>CSCE 155N</td>
<td>Computer Science I: Engineering and Science Focus</td>
<td>3</td>
</tr>
</tbody>
</table>

**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

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGEN 112 /</td>
<td>Computer-Aided Problem-Solving</td>
<td>2</td>
</tr>
<tr>
<td>BSEN 112</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHEM 110</td>
<td>General Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>MATH 107</td>
<td>Calculus II</td>
<td>4</td>
</tr>
</tbody>
</table>

**Agricultural or Biological Sciences Elective**

Select one of the following: 3-4

- AGRO 131  Plant Science
- AGRO 153  Soil Resources
- BIOS 101  General Biology
- BIOS 101L General Biology Laboratory
- LIFE 120  Fundamentals of Biology I
- LIFE 120L 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:** 16-17

### Third Semester

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGEN 225 /</td>
<td>Engineering Properties of Biological Materials</td>
<td>3</td>
</tr>
<tr>
<td>BSEN 225</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENGR 20</td>
<td>Sophomore Engineering Seminar</td>
<td>0</td>
</tr>
<tr>
<td>MATH 208</td>
<td>Calculus III</td>
<td>4</td>
</tr>
<tr>
<td>JGEN 200</td>
<td>Technical Communication I</td>
<td>3</td>
</tr>
<tr>
<td>MSYM 232</td>
<td>Power and Machinery Principles</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 211</td>
<td>General Physics I</td>
<td>4</td>
</tr>
</tbody>
</table>

**Credit Hours Subtotal:** 17

### Fourth Semester

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGEN 260 /</td>
<td>Instrumentation I for Agricultural and Biological Systems Engineering</td>
<td>3</td>
</tr>
<tr>
<td>BSEN 260</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATH 221</td>
<td>Differential Equations</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 212</td>
<td>General Physics II</td>
<td>4</td>
</tr>
<tr>
<td>MECH 223</td>
<td>Engineering Statics</td>
<td>3</td>
</tr>
</tbody>
</table>

**ACE Elective:**

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

**Credit Hours Subtotal:** 17

### Fifth Semester

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGEN 324 /</td>
<td>Mechanics of Materials for Agricultural and</td>
<td>3</td>
</tr>
<tr>
<td>BSEN 324</td>
<td>Biological Systems Engineering</td>
<td></td>
</tr>
<tr>
<td>MECH 130</td>
<td>Introduction to CAD</td>
<td>3</td>
</tr>
<tr>
<td>MECH 373</td>
<td>Engineering Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>MECH 200</td>
<td>Engineering Thermodynamics</td>
<td>3</td>
</tr>
</tbody>
</table>

**ACE Elective:**

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

**Credit Hours Subtotal:** 18

### Sixth Semester

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGEN 303 /</td>
<td>Principles of Process Engineering</td>
<td>3</td>
</tr>
<tr>
<td>BSEN 303</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AGEN 325 /</td>
<td>Power Systems Design</td>
<td>3</td>
</tr>
<tr>
<td>BSEN 325</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AGEN 344 /</td>
<td>Biological and Environmental Transport Processes</td>
<td>3</td>
</tr>
<tr>
<td>BSEN 344</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BSEN 206</td>
<td>Engineering Economics</td>
<td>3</td>
</tr>
<tr>
<td>CIVE 310 /</td>
<td>Fluid Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>MECH 310</td>
<td></td>
<td></td>
</tr>
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</table>

**Credit Hours Subtotal:** 15

### Seventh Semester

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>AGEN 424</td>
<td>Machine Design in Agricultural Engineering</td>
<td>3</td>
</tr>
<tr>
<td>AGEN 453 /</td>
<td>Irrigation and Drainage Systems</td>
<td>3</td>
</tr>
<tr>
<td>BSEN 453</td>
<td>Engineering</td>
<td></td>
</tr>
<tr>
<td>AGEN 470 /</td>
<td>Design I in Agricultural and Biological Engineering</td>
<td>1</td>
</tr>
<tr>
<td>BSEN 470</td>
<td>Systems Engineering</td>
<td></td>
</tr>
<tr>
<td>AGEN 460 /</td>
<td>Instrumentation and Controls</td>
<td>3</td>
</tr>
<tr>
<td>BSEN 460</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MECH 321</td>
<td>Engineering Statistics and Data Analysis</td>
<td>3</td>
</tr>
<tr>
<td>or STAT 380</td>
<td>Statistics and Applications</td>
<td></td>
</tr>
</tbody>
</table>

**Emphasis Elective:**

Select 3 hours

**Credit Hours Subtotal:** 18

### Eighth Semester

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGEN 480 /</td>
<td>Design II in Agricultural and Biological Engineering</td>
<td>3</td>
</tr>
<tr>
<td>BSEN 480</td>
<td>Systems Engineering</td>
<td></td>
</tr>
</tbody>
</table>

**ACE Electives:**

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

**Emphasis Elective:**

Select 6 hours

**Credit Hours Subtotal:** 18

**Total Credit Hours:** 123-124

### AGEN Primary Emphasis Area Requirements

An emphasis area requires 9 hours.

#### Soil and Water Resources Engineering

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGEN 350 /</td>
<td>Soil and Water Resources Engineering</td>
<td>3</td>
</tr>
<tr>
<td>BSEN 350</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Emphasis Elective:**

Select one of the following: 3

- AGEN 441 /  Animal Waste Management
- BSEN 441
BSEN 455 / CIVE 455  Nonpoint Source Pollution Control Engineering
BSEN 458 / CIVE 458  Groundwater Engineering

**STEM Elective**
Select 3 hours of the following: 3
- AGEN 441  Animal Waste Management
- AGEN 395  Internship in Agricultural and Biological Systems Engineering
- 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 / AGRO 431 / MSYM 431  Site-specific Crop Management 3
- MSYM 433  Equipment and Tractor Testing 3

**STEM Elective**
Select 3 hours of the following: 3
- AGEN 395  Internship in Agricultural and Biological Systems Engineering
- 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**

**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
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
Prerequisite for:

Format:

Max credits per degree:

Max credits per semester:

Credit Hours

conductivity.

particle size, strength, moisture content, specific heat, and thermal techniques for measurement of properties including frictional effects, storage, and processing systems for agricultural crops; principles and Description:

Prerequisites:

Crosslisted with:

AGEN 225 Engineering Properties of Agricultural and 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

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

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
Agricultural Engineering

- 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
- 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, Bartlett 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, University of Nebraska-Lincoln - Lincoln NE
- Ph.D. Electrical Engineering, University of Texas at Austin - Austin TX