MECHANIZED SYSTEMS MANAGEMENT

Description
Website: http://msym.unl.edu

The mechanized systems management (MSYM) major prepares students for delivery, management, and technical support of engineered systems for agriculture, food, energy, and water. Students will develop technical, systems analysis, and management skills. This major is ideal for students interested in working with machinery and equipment systems from a practical perspective. The MSYM program includes hands-on coursework in power and machinery systems, processing and handling equipment, and sensors and controls combined with coursework in business, management, agriculture, and natural sciences that prepares students for a wide range of careers in a variety of industries related to agriculture, food, energy, and water. The program offers four options for specialization: production, technical, business and processing operations.

Students in the MSYM major benefit from small classes and personalized faculty advising. Students have the opportunity to work part-time in the Nebraska Tractor Test Laboratory and numerous departmental research projects. Students are encouraged to participate in student clubs such as the Mechanized Systems Management Club, the Tractor Restoration Club, and the University of Nebraska–Lincoln Quarter Scale Tractor Team.

College Requirements

College Admission
Requirements for admission into the College of Agricultural Sciences and Natural Resources (CASNR) are consistent with general University admission requirements (one unit equals one high school year): 4 units of English, 4 units of mathematics, 3 units of natural sciences, 3 units of social studies, and 2 units of foreign language. Students must also meet performance requirements (ACT composite of 20 or higher OR combined SAT score of 950 or higher OR rank in the top one-half of graduating class; transfer students must have a 2.0 on a 4.0 scale) cumulative grade point average and 2.0 on the most recent term of attendance. For students entering the PGA Golf Management degree program, a certified golf handicap of 12 or better (e.g., USGA handicap card) or written ability (MS Word file) equivalent to a 12 or better handicap by a PGA professional or high school golf coach is required. For more information, please visit: http://pgm.unl.edu/requirements.

Admission Deficiencies/Removal of Deficiencies
Students who are admitted to CASNR with core course deficiencies must remove these deficiencies within the first 30 credit hours at the University of Nebraska–Lincoln, or within the first calendar year at Nebraska, whichever takes longer, excluding foreign languages. Students have up to 60 credit hours to remove foreign language deficiencies. College-level coursework taken to remove deficiencies may be used to meet degree requirements in CASNR.

Deficiencies in the required entrance subjects can be removed by completion of specified courses in the University or by correspondence.

The Office of Admissions, Alexander Building (south entrance), City Campus, provides information to new students on how deficiencies can be removed.

College Degree Requirements

Curriculum Requirements
The curriculum requirements of the College consist of three areas: ACE (Achievement-Centered Education); College of Agricultural Sciences and Natural Resources Core; and Degree Program requirements and electives. All three areas of the College Curriculum Requirements are incorporated within the description of the Major/Degree Program sections of the catalog. The individual major/degree program listings of classes insures that a student will meet the minimum curriculum requirements of the College.

Foreign Languages/Language Requirement
Two units of a foreign language are required. This requirement is usually met with two years of high school language.

Minimum Hours Required for Graduation
The College grants the bachelors degree in programs associated with agricultural sciences, natural resources and related programs. Students working toward a degree must earn at least 120 semester hours of credit. A minimum cumulative grade point average of C (2.0 on a 4.0 scale) must be maintained throughout the course of studies and is required for graduation. Some degree programs have a higher cumulative grade point average required for graduation. Please check the degree program on its graduation cumulative grade point average.

Grade Rules
Removal of C-, D and F Grades
Only the most recent letter grade received in a given course will be used in computing a student’s cumulative grade point average if the student has completed the course more than once and previously received a grade or grades below C in that course.

The previous grade (or grades) will not be used in the computation of the cumulative grade point average, but it will remain a part of the academic record and will appear on any transcript.

A student can remove from his/her cumulative average a course grade of C-, D+, D, D- or F if the student repeats the same course at the University of Nebraska and receives a grade other than P (pass), I (incomplete), N (no pass), W (withdrawn), or NR (no report). If a course is no longer offered, it is not eligible for the revised grade point average computation process.

For complete procedures and regulations, see the Office of the University Registrar website at http://www.unl.edu/regrec/course-repeats.

Pass/No Pass
Students in CASNR may take any course offered on a Pass/No Pass basis within the 24-hour limitation established by the Faculty Senate. However, a department may specify that the Pass/No Pass status of its courses be limited to non-majors or may choose to offer some courses for letter grades only.

GPA Requirements
A minimum cumulative grade point average of C (2.0 on a 4.0 scale) must be maintained throughout the course of studies and is required for graduation. Some degree programs have a higher cumulative grade point average required for graduation. Please check the degree program on its graduation cumulative grade point average.
Transfer Credit Rules
To be considered for admission, a transfer student, Nebraska resident or nonresident, must have an accumulated average of C (2.0 on a 4.0 scale) and a minimum C average in the last semester of attendance at another college. Transfer students who have completed less than 12 credit hours of college study must submit either ACT or SAT scores.

Ordinarily, credits earned at an accredited college are accepted by the University. The College, however, will evaluate all hours submitted on an application for transfer and reserves the right to accept or reject any of them. Sixty (60) is the maximum number of hours the University will accept on transfer from a two-year college. Ninety (90) is the maximum number of hours the University will accept from a four-year college. Transfer credit in the degree program must be approved by the degree program advisor on a Request for Substitution Form to meet specific course requirements, group requirements, or course level requirements in the major. At least 9 hours in the major field, including the capstone course, must be completed at the University of Nebraska–Lincoln regardless of the number of hours transferred.

The College will accept no more than 10 semester hours of C-, D+, D and D- grades from other schools. The C-, D+, D and D- grades can only be applied to free electives. This policy does not apply to the transfer of grades from UNO or UNK to the University of Nebraska–Lincoln.

Joint Academic Transfer Programs
The College of Agricultural Sciences and Natural Resources has agreements with many institutions to support joint academic programs. The transfer programs include dual degree programs and cooperative degree programs. Dual degree programs offer students the opportunity to receive a degree from a participating institution and also to complete requirements for a bachelor of science degree in CASNR. Cooperative programs result in a single degree from either the University of Nebraska–Lincoln or the cooperating institution.

Dual Degree Programs
A to B Programs
The A to B Program, a joint academic program offered by the CASNR and participating community colleges, allows students to complete the first two years of a degree program at the participating community college and continue their education and study in a degree program leading toward a bachelor of science degree.

The A to B Program provides a basic knowledge plus specialized coursework. Students transfer into CASNR with junior standing.

Depending on the community college, students enrolled in the A to B Program may complete the requirements for an associate of science at the community college, transfer to the University of Nebraska–Lincoln, and work toward a bachelor of science degree.

Participating community colleges include:
- Central Community College
- Metropolitan Community College
- Mid-Plains Community College
- Nebraska College of Technical Agriculture
- Northeast Community College
- Southeast Community College
- Western Nebraska Community College

3+2 Programs
Two specialized degree programs in animal science and veterinary science are offered jointly with an accredited college or school of veterinary medicine. These two programs permit CASNR animal science or veterinary science students to receive a bachelor of science degree from the University of Nebraska–Lincoln with a degree in animal science or veterinary science after successfully completing two years of the professional curriculum in veterinary medicine at an accredited veterinary school. Students who successfully complete the 3+2 Program, must complete the Application for Degree form and provide transcripts to the Credentials Clerk, Office of the University Registrar, 107 Canfield Administration Building. Students should discuss these degree programs with their academic advisor.

Cooperative Degree Programs
Academic credit from the University and a cooperating institution is applied towards a four-year degree from either the University of Nebraska–Lincoln (University degree-granting program) or the cooperating institution (non University degree-granting program). All have approved programs of study.

UNL Degree-Granting Programs
A University of Nebraska–Lincoln degree-granting program is designed to provide students the opportunity to complete a two-year program of study at one of the four-year institutions listed below, transfer to CASNR and complete the requirements for a bachelor of science degree.

Chadron State College. Chadron State College offers a 2+2 program leading to a grassland ecology and management degree program and a transfer program leading to a bachelor of science in agricultural education in the teaching option.

Wayne State College. Wayne State College offers a 3+1 program leading to a bachelor of science in plant biology in the ecology and management option.

University of Nebraska at Kearney. Transfer programs are available for students pursuing degree programs leading to a bachelor of science degree.

University of Nebraska at Omaha. The University of Nebraska at Omaha (UNO) cooperates with CASNR in providing four-semester pre-agricultural sciences, pre-natural resources, pre-food science and technology, pre-horticulture and pre-turfgrass and landscape management transfer programs.

A student enrolled in these programs may transfer all satisfactorily completed academic credits identified in the suggested program of study, and enter CASNR to study toward a degree program leading to a bachelor of science degree. The total program would require a minimum of four years or eight semesters (16 credit hours/semester or 120 credit hours).

Nebraska CASNR faculty teach horticulture and food science and technology courses at UNO to assist an urban population in better understanding the food processing, horticulture, and landscape horticulture industries.

For more information, contact the CASNR Dean’s Office, 800-472-8800, ext. 2541.

Non University of Nebraska–Lincoln Degree-Granting Programs
CASNR cooperates with other institutions to provide coursework that is applied towards a degree at the cooperating institution. Pre-professional programs offered by CASNR allow students to complete the first two or
three years of a degree program at the University prior to transferring and completing a degree at the cooperating institution.

**Chadron State College—Range Science.** The 3+1 Program in range science allows Chadron State College students to pursue a range science degree through Chadron State College. Students complete three years of coursework at Chadron State College and one year of specialized range science coursework (32 credit hours) at CASNR.

**Dordt College (Iowa)—Agricultural Education: Teaching Option.** This program allows students to pursue an Agricultural Education Teaching Option degree leading toward a bachelor of science in agricultural education. Students at Dordt College will complete 90 credit hours in the Agricultural Education: Teaching Option Transfer Program.

**Residency**
Students must complete at least 30 of the total hours for their degree using University of Nebraska—Lincoln credits. At least 18 of the 30 credit hours must be in courses offered through CASNR (ACE 10-299) including the appropriate ACE 10 degree requirement or an approved ACE 10 substitution offered through another Nebraska college and excluding independent study regardless of the number of hours transferred. Credit earned during education abroad may be used toward the residency requirement if students register through UNL and participate in prior-approved education abroad programs. University of Nebraska—Lincoln open enrollment and summer independent study courses count toward residency.

**Online and Distance Education**
There are many opportunities to earn college credit online through the University of Nebraska—Lincoln. Some of these credits may be applicable not only as elective credits, but also toward the fulfillment of the College's education requirements. Credits earned online may count toward residency. However, certain offerings may not be counted toward scholarship requirements or academic recognition criteria.

For further information, contact:
Office of Online and Distance Education
University of Nebraska—Lincoln
305 Brace Labs
Lincoln, NE 68588-0109
402-472-4681
http://online.unl.edu/

**Independent Study Rules**
Students wishing to take part in independent studies must obtain permission; complete and sign a contract form; and furnish copies of the contract to the instructor, advisor, departmental office, and the Dean's Office. The contract should be completed before registration. Forms are available in 103 Agricultural Hall or online at the CASNR website.

Independent study projects include research, literature review or extension of coursework under supervision and evaluation of a departmental faculty member.

Students may only count 12 hours of independent study toward their degrees and no more than 6 hours can be counted during their last 36 hours earned, excluding senior thesis, internships, and courses taught under an independent study number.

**Other College Degree Requirements**

**Capstone Course Requirement**
A capstone course is required for each CASNR degree program. A capstone course is defined as a course in which students are required to integrate diverse bodies of knowledge to solve a problem or formulate a policy of societal importance.

**ACE Requirements**
All students must fulfill the Achievement Centered Education (ACE) requirements. Information about the ACE program may be viewed at ace.unl.edu.

The minimum requirements of CASNR reflect the common core of courses that apply to students pursuing degrees in the college. Students should work with an advisor to satisfy ACE outcomes 1, 2, 3, 4, 6 and 10 with the college requirements.

**Catalog Rule**
Students must fulfill the requirements stated in the catalog for the academic year in which they are first admitted to the University of Nebraska—Lincoln or when they were first admitted to a Joint Academic Transfer Program. 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 Agricultural Sciences and Natural Resources. 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 mechanized systems management will be able to:

1. Apply hands-on technical skills and knowledge from the natural and social sciences, technology, engineering, and mathematics to analyze and manage mechanized systems relevant to agriculture, food, energy, and water.
2. Identify the structure, layout and function of mechanized systems including the relationships between individual components of a system.
3. Evaluate a system critically by defining a problem, assimilating information, conducting an analysis, and making technical and economic recommendations to improve performance of the system while accounting for potential social and environmental impacts.
4. Develop professional written and oral reports to describe a mechanized system and communicate an analysis of the system that includes objectives, methods, results and recommendations.

**Major Requirements**

**Core Requirements**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCIL 101</td>
<td>Science and Decision-Making for a Complex World</td>
<td>3</td>
</tr>
<tr>
<td>MSYM 462</td>
<td>Equipment Systems</td>
<td>3</td>
</tr>
</tbody>
</table>

Credit Hours Subtotal: 6

**Mathematics and Statistics (ACE 3)**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 102</td>
<td>Trigonometry</td>
<td>2</td>
</tr>
<tr>
<td>STAT 218</td>
<td>Introduction to Statistics</td>
<td>3</td>
</tr>
</tbody>
</table>

Credit Hours Subtotal: 5
Mechanized Systems Management

Communications
BSEN 130 / CIVE 130  Computer-Aided Design  2-3
or MECH 130  Introduction to CAD
Select one Written Communication elective (ACE 1) of the following:
JGEN 200  Technical Communication I
ENGL 150  Writing and Inquiry
ENGL 151  Writing and Argument
Select one Professional Communication elective (ACE 2) of the following:
JGEN 300  Technical Communication II
COMM 209  Public Speaking
COMM 210  Communicating in Small Groups
COMM 286  Business and Professional Communication
Credit Hours Subtotal:  8-9

Natural Sciences
Select one CASNR approved Life Sciences elective (ACE 4) of the following:
AGRO 131  Plant Science
AGRO 132  and Agronomic Plant Science Laboratory
BIOS 101  General Biology
BIOS 101L  and General Biology Laboratory
LIFE 120  Fundamentals of Biology I
LIFE 120L  and Fundamentals of Biology I Laboratory
CHEM 109  General Chemistry I (ACE 4)
MSYM 109  Physical Principles in Agriculture and Life
MSYM 109L  Sciences
Select 7 hours of Natural Sciences electives of the following:  7
Biochemistry
Biology
Chemistry
Geography (excluding human and economic)
Geology
Life Sciences (excluding 115)
Meteorology (excluding 140)
Physics and Astronomy (excluding 103)
Credit Hours Subtotal:  20

Economics, Humanities and Social Sciences
ECON 211  Principles of Macroeconomics (ACE 8)
ECON 212  Principles of Microeconomics
or AECN 141  Introduction to the Economics of Agriculture
Select one course each from ACE outcomes 5, 7, and 9  9
Credit Hours Subtotal:  15

Major Requirements
Complete requirements  24
Credit Hours Subtotal:  24

Option Requirements
Complete requirements  33
Credit Hours Subtotal:  33

Personal Development Electives
Select 9 hours  9

Credit Hours Subtotal:  9

Total Credit Hours:  120-121

Specific Major Requirements

Major Requirements
MSYM 162  Introduction to Mechanized Systems Management  1
MSYM 232  Power and Machinery Principles  3
MSYM 245  Electrical Service Systems  3
MSYM 262  Problem Solving in Mechanized Systems Management  1
MSYM 354 / SOIL 354 / WATS 354  Soil Conservation and Watershed Management  3
MSYM 364  Agricultural Products Processing and Handling  3
MSYM 416  Sensors and Control Systems for Agri-Industries  3
BSEN 206 / CONE 206  Engineering Economics  3
SOIL 153 / AGRO 153 / HORT 153  Soil Resources  4
Credit Hours Subtotal:  24
Total Credit Hours:  24

Production Option
The production option is for students interested in careers in production agriculture such as farming, ranching, and crop consulting. The option integrates coursework in mechanized systems management with agricultural sciences, management, and marketing. Students have flexibility in course selection to pursue minors in areas such as agronomy and animal science.

Option Requirements
AGRO 204  Resource-Efficient Crop Management  3
AECN 201  Farm and Ranch Management  4
AECN 235  Introduction to Commodity Marketing  3
ASCI 250  Animal Management  3

Mechanized Systems Management Electives
Select three of the following:  9
MSYM 342  Animal Housing Systems
MSYM 412  Hydraulic Power Systems
MSYM 431 / AGEN 431 / AGRO 431  Site-specific Crop Management
MSYM 433  Equipment and Tractor Testing
MSYM 452 / AGRO 452 / WATS 452  Irrigation Systems Management

Production Agriculture Electives
Select 8-11 hours from specified CASNR courses at 200 level or above  8-11

Option Electives
Select 0-3 hours

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSYM 395</td>
<td>Internship in Mechanized Systems Management</td>
</tr>
<tr>
<td></td>
<td><strong>Business or agricultural economics course</strong></td>
</tr>
<tr>
<td>Credit Hours Subtotal:</td>
<td>33-36</td>
</tr>
<tr>
<td>Total Credit Hours</td>
<td>33-36</td>
</tr>
</tbody>
</table>

1 Refer to degree audit or contact advisor for list of classes.

**Business Option**

The business option is for students interested in business-related careers such as marketing, sales, and management in agriculture and related industries. This option integrates coursework in mechanized systems management with additional business courses. Students can easily pursue a business minor with this option.

**Option Requirements**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACCT 200</td>
<td>Accounting for Business Decisions</td>
</tr>
<tr>
<td>AGRO 204</td>
<td>Resource-Efficient Crop Management</td>
</tr>
<tr>
<td>or ASCI 250</td>
<td>Animal Management</td>
</tr>
<tr>
<td>MATH 104</td>
<td>Applied Calculus</td>
</tr>
<tr>
<td>MSYM 342</td>
<td>Animal Housing Systems</td>
</tr>
<tr>
<td>MSYM 395</td>
<td>Internship in Mechanized Systems Management</td>
</tr>
<tr>
<td>MSYM 412</td>
<td>Hydraulic Power Systems</td>
</tr>
<tr>
<td>MSYM 431 / AGEN 431 / AGRO 431</td>
<td>Site-specific Crop Management</td>
</tr>
<tr>
<td>MSYM 452 / AGRO 452 / WATS 452</td>
<td>Irrigation Systems Management</td>
</tr>
<tr>
<td>MSYM 395</td>
<td>Internship in Mechanized Systems Management</td>
</tr>
<tr>
<td></td>
<td><strong>Management Electives</strong></td>
</tr>
<tr>
<td>Select 9 hours of the following:</td>
<td>9</td>
</tr>
<tr>
<td>MSYM 342</td>
<td>Animal Housing Systems</td>
</tr>
<tr>
<td>MSYM 395</td>
<td>Internship in Mechanized Systems Management</td>
</tr>
<tr>
<td>MSYM 412</td>
<td>Hydraulic Power Systems</td>
</tr>
<tr>
<td>MSYM 431 / AGEN 431 / AGRO 431</td>
<td>Site-specific Crop Management</td>
</tr>
<tr>
<td>MSYM 452 / AGRO 452 / WATS 452</td>
<td>Irrigation Systems Management</td>
</tr>
<tr>
<td>MSYM 452</td>
<td>Irrigation Systems Management</td>
</tr>
<tr>
<td>or MSYM 400A</td>
<td>Occupational Safety</td>
</tr>
<tr>
<td>MSYM 412</td>
<td>Hydraulic Power Systems</td>
</tr>
<tr>
<td>MSYM 433</td>
<td>Equipment and Tractor Testing</td>
</tr>
</tbody>
</table>

**Business Law Elective**

Select one of the following: 3

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>AECN 256</td>
<td>Legal Aspects in Agriculture</td>
</tr>
<tr>
<td>AECN 357 / NREE 357</td>
<td>Natural Resource and Environmental Law</td>
</tr>
<tr>
<td>BLAW 300</td>
<td>Business, Government &amp; Society</td>
</tr>
</tbody>
</table>

**Finance Elective**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>AECN 452</td>
<td>Agricultural Finance</td>
</tr>
<tr>
<td>or FINA 300</td>
<td>Financial Decision Making</td>
</tr>
</tbody>
</table>

**Marketing Elective**

Select one of the following: 3

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>AECN 225 / EAEP 225 / MRKT 225</td>
<td>Agribusiness Entrepreneurship in Food Products Marketing</td>
</tr>
<tr>
<td>AECN 235</td>
<td>Introduction to Commodity Marketing</td>
</tr>
<tr>
<td>MRKT 300</td>
<td>Contemporary Marketing</td>
</tr>
</tbody>
</table>

**Management Electives**

Select two of the following: 6-7

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>AECN 201</td>
<td>Farm and Ranch Management</td>
</tr>
<tr>
<td>AECN 316</td>
<td>Agribusiness Management</td>
</tr>
<tr>
<td>MNGT 300</td>
<td>Management Essentials For Contemporary Organizations</td>
</tr>
<tr>
<td>MNGT 322 / ENTR 322</td>
<td>Family Business</td>
</tr>
<tr>
<td>MNGT 361</td>
<td>Human Resource Management</td>
</tr>
</tbody>
</table>

**Technical Option**

The technical option is for students interested in hands-on technical careers such as test engineers, product support specialists, and service managers. This option integrates coursework in mechanized systems management with additional coursework in engineering. This option will also prepare students for graduate study.

**Option Requirements**

Select one of the following: 3

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGRO 204</td>
<td>Resource-Efficient Crop Management</td>
</tr>
<tr>
<td>ASCI 250</td>
<td>Animal Management</td>
</tr>
<tr>
<td>ASCI 210</td>
<td>Animal Products</td>
</tr>
<tr>
<td>MATH 106</td>
<td>Calculus I</td>
</tr>
<tr>
<td>MSYM 395</td>
<td>Internship in Mechanized Systems Management</td>
</tr>
<tr>
<td>or MSYM 400A</td>
<td>Occupational Safety</td>
</tr>
<tr>
<td>MSYM 412</td>
<td>Hydraulic Power Systems</td>
</tr>
<tr>
<td>MSYM 433</td>
<td>Equipment and Tractor Testing</td>
</tr>
</tbody>
</table>

**Management Electives**

Select two of the following: 6

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>AECN 316</td>
<td>Agribusiness Management</td>
</tr>
<tr>
<td>MNGT 300</td>
<td>Management Essentials For Contemporary Organizations</td>
</tr>
<tr>
<td>SCMA 331</td>
<td>Operations and Supply Chain Management</td>
</tr>
<tr>
<td>MNGT 361</td>
<td>Human Resource Management</td>
</tr>
</tbody>
</table>

**Option Electives**

Select four of the following: 12

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARCH 331</td>
<td>Structural Mechanics</td>
</tr>
<tr>
<td>ENSC 220</td>
<td>Introduction to Energy Systems</td>
</tr>
<tr>
<td>CNST 305 / ARCH 333</td>
<td>Building Environmental Technical Systems</td>
</tr>
<tr>
<td>MSYM 342</td>
<td>Animal Housing Systems</td>
</tr>
<tr>
<td>MSYM 431 / AGEN 431 / AGRO 431</td>
<td>Site-specific Crop Management</td>
</tr>
<tr>
<td>MSYM 452 / AGRO 452 / WATS 452</td>
<td>Irrigation Systems Management</td>
</tr>
</tbody>
</table>

Credit Hours Subtotal: 33-35

Total Credit Hours 33-35

**Processing Operations Option**

The processing operations option is for students interested in careers in operations management for food, feed, and fuel companies. This option integrates coursework in mechanized systems management, with business, agricultural sciences, and food sciences. This option will also prepare students for graduate study.

**Option Requirements**

AGRO 437 Animal, Food and Industrial Uses of Grain 2
### AECN 235
Introduction to Commodity Marketing

### ASCI 210
Animal Products

### MATH 104
Applied Calculus

### MSYM 395
Internship in Mechanized Systems Management

### SCMA 331
Operations and Supply Chain Management

### MSYM 363 / FDST 363
Heat and Mass Transfer

### MSYM 412
Hydraulic Power Systems

### MSYM 465 / FDST 465
Food Engineering Unit Operations

### Processing Electives
Select 7-9 hours of the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGRO 438</td>
<td>Producing Grain for Animal, Food and Industrial Uses</td>
</tr>
<tr>
<td>ASCI 410</td>
<td>Processed Meats</td>
</tr>
<tr>
<td>ENSC 220</td>
<td>Introduction to Energy Systems</td>
</tr>
<tr>
<td>FDST 205</td>
<td>Food Composition and Analysis</td>
</tr>
<tr>
<td>FDST 372 / NUTR 372</td>
<td>Food Safety and Sanitation</td>
</tr>
<tr>
<td>FDST 403</td>
<td>Food Quality Assurance</td>
</tr>
<tr>
<td>FDST 412</td>
<td>Cereal Technology</td>
</tr>
<tr>
<td>FDST 420</td>
<td>Fruit and Vegetable Technology</td>
</tr>
<tr>
<td>FDST 429</td>
<td>Dairy Products Technology</td>
</tr>
</tbody>
</table>

**Credit Hours Subtotal:** 33-37

### Electives
Students can select 9 credit hours of personal development electives. These electives can be used to foster greater understanding of a topic of interest, to develop an inherent skill, or to pursue a minor.

### Requirements for Minor Offered by Department

#### 12-Credit-Hour Mechanized Systems Management Minor
- A minimum of 12 credit hours of mechanized systems management coursework at the 300 level or above.

#### 18-Credit-Hour Mechanized Systems Management Minor
- A minimum of 18 credit hours of mechanized systems management coursework (excluding MSYM 109 Physical Principles in Agriculture and Life Sciences and MSYM 162 Introduction to Mechanized Systems Management) with at least 9 credit hours at the 300 level or above.

MSYM 109 Physical Principles in Agriculture and Life Sciences

**Prerequisites:** MATH 101 or 102 or 103 or 104 or 106; or placement in MATH 102 or 104 or 106.

**Notes:** Students cannot receive credit for both MSYM 109 and PHYS 141 or 151.

**Description:** Fundamental principles of mechanics, heat, electricity, magnetism and electromagnetism and their relationship to energy utilization and conservation. Principles then applied to problem situations in agriculture and life sciences.

**Credit Hours:** 4

Max credits per semester: 4

Max credits per degree: 4

**Format:** LEC

**Prerequisite for:** FDST 363, MSYM 363; MSYM 109L; MSYM 232; MSYM 245; MSYM 262; MSYM 312; MSYM 342; MSYM 354, SOIL 354, WATS 354; MSYM 364; MSYM 452, MSYM 852, WATS 452, AGRO 452

**ACE:** ACE 4 Science

MSYM 109L Physical Principles in Agriculture and Life Sciences Laboratory

**Prerequisites:** MSYM 109 or parallel, or PHYS 151

**Description:** Laboratory experiments on mechanics, heat, electricity, magnetism and electromagnetism and their relationship to energy utilization and conservation in agriculture and life sciences.

**Credit Hours:** 1

Max credits per semester: 1

Max credits per degree: 1

**Format:** LAB

MSYM 162 Introduction to Mechanized Systems Management

**Description:** Basic principles of describing and evaluating mechanized systems relevant to agriculture, food, energy, and water. Problem solving using systems-thinking. Exploration of major and career opportunities.

**Academic success and planning.**

**Credit Hours:** 1

Max credits per semester: 1

Max credits per degree: 1

**Format:** LEC

MSYM 232 Power and Machinery Principles

**Prerequisites:** MSYM 109 or PHYS 141 or PHYS 151 or PHYS 211

**Description:** Operational characteristics of IC engines, field, material-handling, and processing machines and their components. Includes analyses, estimations, and objective comparisons of performance; principles for adjustment and calibration of metering systems; and cost-effective sizing of machines. Exercises include using ASABE Standards and available reports of machine performance (tractor test reports, etc.).

**Credit Hours:** 3

Max credits per semester: 3

Max credits per degree: 3

**Format:** LEC

MSYM 245 Electrical Service Systems

**Prerequisites:** MSYM 109 or high school physics.

**Description:** Utilization of electric energy in agricultural production, processing, and residential applications. Wiring installations; selection of safe and adequate circuit devices; service equipment and conductors; and electric motors and their control; and energy management.

**Credit Hours:** 3

Max credits per semester: 3

Max credits per degree: 3

**Format:** LEC

**Prerequisite for:** MSYM 412, MSYM 416
MSYM 262 Problem Solving in Mechanized Systems Management
Prerequisites: MSYM 109 or PHYS 141 or PHYS 151 or PHYS 211.
Notes: Open to MSYM majors only.
Description: Use of computational tools to solve problems relevant to mechanized systems management. Professional communication of technical information. Discussion of current and emerging issues relevant to the major.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Format: LEC
Offered: SPRING

MSYM 299 Career Experiences
Prerequisites: Permission and advanced approval of plan or work.
Description: Student participation in physical systems applications. May include participation in mechanization-related areas of agribusiness, production practices, and processing operations; research in laboratory, greenhouse and field; or preparation of teaching materials.
Credit Hours: 1-5
Min credits per semester: 1
Max credits per semester: 5
Max credits per degree: 12
Format: IND

MSYM 312 Engine Power Systems
Prerequisites: MSYM 109 or general physics.
Description: Internal combustion engine power systems used in agriculture with primary emphasis on power needs for both mobile and fixed operations, characteristics of power sources and energy resources, and selection and use of power units.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

MSYM 342 Animal Housing Systems
Prerequisites: MSYM 109 or PHYS 141 or PHYS 151 or PHYS 211
Description: Production facilities for livestock and poultry will be developed with emphasis on building and feedlot layout, ventilation, heating and cooling systems; energy utilization; and construction materials and methods.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Offered: FALL

MSYM 354 Soil Conservation and Watershed Management
Crosslisted with: SOIL 354, WATS 354
Prerequisites: AGRO/SOIL 153; and MSYM 109 or PHYS 141 or PHYS 151 or PHYS 211
Description: Watershed hydrology, soil erosion, erosion control, water management, and land surveying and mapping. Includes rainfall-runoff relationships; determination of watershed characteristics; terraces, waterways, vegetative filters, and residue management; ponds, wetlands, non-point source pollution control, and water conservation; profile and topographic surveying.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Offered: FALL

MSYM 363 Heat and Mass Transfer
Crosslisted with: FDST 363
Prerequisites: MATH 104 or 106; MSYM 109 or PHYS 141 or 151.
Description: Fundamentals of food engineering including material and energy balances, fluid mechanics, heat transfer and mass transfer.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

MSYM 364 Agricultural Products Processing and Handling
Prerequisites: MSYM 109 or PHYS 141 or PHYS 151 or PHYS 211
Description: Analysis of processing and handling operations. Chemical and physical characteristics of agricultural products. Application of psychrometrics. Power requirements, capacities, and efficiencies of drying and conveying systems. Discussion of safety issues, logistics, and survey of industry technologies.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Offered: SPRING

MSYM 395 Internship in Mechanized Systems Management
Prerequisites: Junior standing.
Notes: Completion of internship approval form is required. The internship proposal is subject to approval by the Department of Biological Systems Engineering. Pass/No Pass only.
Description: Practical experience, directed learning, and career exploration and development in a selected business, industry, agency, or educational institution.
Credit Hours: 1-3
Min credits per semester: 1
Max credits per semester: 3
Max credits per degree: 5
Format: FLD

MSYM 400A Occupational Safety
Prerequisites: Junior standing
Notes: Contact CASNR Distance Education Consortium Coordinator for course details, prerequisites and registration information.
Description: Identifies safety and health risks in industrial work environments. Focus on how managers and supervisors meet their responsibilities for providing a safe workplace for their employees. Includes the identification and remediation of workplace hazards.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

MSYM 400B Agricultural Safety and Health
Notes: Contact CASNR Distance Education Consortium Coordinator for course details, prerequisites and registration information.
Description: Safety concepts, principles, practices, rules and regulations as they relate to agriculture will be explored. Developing and conducting safety programs, and conducting safety inspections and accident investigations are other aspects of the course.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
MSYM 400E Biorenewable Systems Technology
Notes: Contact CASNR Distance Education Consortium Coordinator for course details, prerequisites and registration information.
Description: The science, engineering, economics and business of converting biorenewable resources into bioenergy and biobased products. Biorenewable concepts as they relate to drivers of change, feedstock production, economics, transportation and logistics, and marketing.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

MSYM 400J Machinery Management Using Precision Agriculture Technology
Prerequisites: Junior standing
Notes: Contact CASNR Distance Education Consortium Coordinator for course details, prerequisites and registration information.
Description: Management of agricultural equipment that is commonly used in conjunction with GPS technology such as planters, combines, fertilizer application equipment, and sprayer application equipment.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

MSYM 400K Chemical Application Systems
Notes: Contact CASNR Distance Education Consortium Coordinator for course details, prerequisites and registration information.
Description: Systems, components, operation practices, and safety procedures used in the chemical application industry. Liquid and granular application systems and respective components will be studied along with procedures for equipment sizing and maintenance, minimizing drift, system calibration, and safe handling-transportation-storage-disposal and spill clean-up of agrichemicals.
Credit Hours: 2
Max credits per semester: 2
Max credits per degree: 2
Format: LEC

MSYM 412 Hydraulic Power Systems
Prerequisites: MSYM 245
Description: Theory and application of fluids under controlled pressure to perform work in mobile and industrial applications. Positive displacement (PD) pumps, linear and rotary hydraulic actuators (hydraulic cylinders and motors), valves, and electric over hydraulic systems will be studied in detail. Fluid power circuit development on both hydraulic benches and computer simulated environments will be performed with emphasis on circuit analysis, and system troubleshooting.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Offered: SPRING

MSYM 416 Sensors and Control Systems for Agri-Industries
Prerequisites: MSYM 245 or permission.
Description: Application of sensors for measurement of process control variables and implementation of microcomputer-based measurement and control systems. Basic electrical and electronic instrumentation plus control of electrically, pneumatically and/or hydraulically powered systems.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

MSYM 431 Site-specific Crop Management
Crosslisted with: AGEN 431, AGRO 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

MSYM 433 Equipment and Tractor Testing
Crosslisted with: MSYM 833
Prerequisites: MSYM 232; and STAT 218 or STAT 380 or MECH 321
Notes: Offered spring semester in even-numbered calendar years.
Description: Principles and procedures involved in testing agricultural equipment and tractors. Actual test planned, scheduled, conducted and reported. Test may be based upon procedures used at the Nebraska Tractor Testing Laboratory or involve other equipment being used for research in the department.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Offered: SPRING

MSYM 436 Embedded Controls for Agricultural Applications
Crosslisted with: AGEN 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
MSYM 452 Irrigation Systems Management
Crosslisted with: MSYM 852, WATS 452, AGRO 452
Prerequisites: MSYM 109 or PHYS 141 or PHYS 151 or PHYS 211
Notes: AGRO/SOIL 153 recommended.
Description: Irrigation management and the selection, evaluation, and improvement of irrigation systems. Includes soil-water measurement, crop water use, irrigation scheduling, irrigation efficiency, measurement of water flow, irrigation systems, groundwater and wells, pumping systems, applying chemicals with irrigation systems, and environmental and water resource considerations.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Offered: FALL
Prerequisite for: AGEN 854, MSYM 854; AGEN 955, AGRO 955, CIVE 955, GEOL 985; MSYM 855

MSYM 462 Equipment Systems
Crosslisted with: MSYM 862
Prerequisites: Senior standing in MYSM
Notes: Capstone course.
Description: Team-based activities to evaluate equipment systems, make technical and economic recommendations, develop professional written and oral reports. Topics include equipment system performance and management, project scheduling and planning, cost estimation, reliability analysis, and risk assessment.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
ACE: ACE 10 Integrated Product

MSYM 465 Food Engineering Unit Operations
Crosslisted with: FDST 465, FDST 865, MSYM 865
Prerequisites: FDST/MSYM 363.
Description: Unit operations and their applications to food processing.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

MSYM 469 Bio-Atmospheric Instrumentation
Crosslisted with: AGRO 469, GEOG 469, HORT 407, METR 469, NRES 469, AGRO 869, GEOG 869, HORT 807, METR 869, MSYM 869, NRES 869
Prerequisites: Junior standing; MATH 106; 4 hrs physics; physical or biological science major.
Description: Discussion and practical application of principles and practices of measuring meteorological and related variables near the earth's surface including temperature, humidity, precipitation, pressure, radiation and wind. Performance characteristics of sensors and modern data collection methods are discussed and evaluated.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Groups: Physical Geography

MSYM 475 Water Quality Strategy
Crosslisted with: NRES 475, NRES 875, SOCI 475, SOCI 875, SOIL 475, WATS 475, AGRO 475, AGRO 875, CIVE 475, CIVE 875, CRPL 475, CRPL 875, GEO 475, GEO 875, MSYM 875, POLS 475, POLS 875
Prerequisites: Senior standing.
Notes: Capstone course.
Description: Holistic approach to the selection and analysis of planning strategies for protecting water quality from nonpoint sources of contamination. Introduction to the use of methods of analyzing the impact of strategies on whole systems and subsystems; for selecting strategies; and for evaluating present strategies.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

MSYM 492 Special Topics in Mechanized Systems Management
Crosslisted with: MSYM 892
Prerequisites: Permission
Description: Subject matter in emerging areas of Mechanized Systems Management 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

MSYM 496 Principles and Problems in Mechanized Agriculture
Crosslisted with: MSYM 896
Prerequisites: 15 hours in MSYM or closely related area.
Description: Individual or group projects in research, literature review, or extension of course work under the supervision and evaluation of a departmental faculty member.
Credit Hours: 1-5
Min credits per semester: 1
Max credits per semester: 5
Max credits per degree: 12
Format: IND

MSYM 499H Honors Thesis
Prerequisites: Admission to the University Honors Program and permission
Notes: AGRI 299H recommended.
Description: Conduct a scholarly research project and write a University Honors Program or undergraduate thesis.
Credit Hours: 3-6
Min credits per semester: 3
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.
Mechanized Systems Management - Business
Mechanized Systems Management - Processing Operations
Mechanized Systems Management - Production
Mechanized Systems Management - Technical

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
• Operations Management LDP, Ardent Mills - Kenosha WI
• Operations Supervisor, Cargill - Nebraska City NE
• Production Supervisor, Land O'Lakes - Harrisburg PA
• Operations Management, Union Pacific - Lincoln NE
• Ag Services Operations Management, Archer Daniels Midland - Fremont NE
• Technical Product Support Specialist, Orthman Manufacturing - Lexington NE
• Marketing Representative - Product Support, John Deere - Waterloo IA
• Field Test Engineer, AGCO Corporation - Hesston KS
• Ag Specialist, JR Simplot Company - Scottsbluff NE
• Product Support Technician, Lindsay Manufacturing - Lindsay NE

Internships
• Ag Services Operations Intern, ADM Grain - Corpus Christi TX
• Marketing Intern, John Deere - Urbandale IA
• Operations Intern, Dow AgroSciences - York NE
• Product Support Intern, John Deere - Ottumwa IA
• Operations Intern, ConAgra Foods - Hastings MN
• Agronomy/Crop Scout Intern, DuPont Pioneer -
• Test Engineer Assistant, Global Industries - Grand Island NE
• Equipment Testing Technician, CLAAS -
• Plant Operations, Scoular - Omaha NE
• Engineering Test Lab Intern, Exmark Manufacturing - Beatrice NE

Graduate & Professional Schools
• M.S. Agricultural & Biological Engineering, Purdue University - West Lafayette IN
• M.S. Mechanized Systems Management, University of Nebraska-Lincoln - Lincoln NE
• M.S. Agricultural & Biological Systems Engineering, University of Nebraska-Lincoln - Lincoln NE
• Ph.D. Engineering, Purdue University - Richmond IN
• Ph.D. Engineering, University of Nebraska-Lincoln - Lincoln NE