

# ANIMAL SCIENCE

The Department of Animal Science Undergraduate Program intends for its graduates to be able to explain the symbiotic relationship of animals and humans, to contribute to the solution of complex problems of animal enterprise management, and to apply their knowledge and skills in a technically demanding global community. Graduates of our program will be knowledgeable about sustainable animal production practices that also ensure animal health and well-being and stewardship of natural resources.

To enable learners to pursue a wide array of career interests, the department offers learning experiences ranging from the basic to the applied sciences. Learner outcomes for these goals, for each of our courses, and other information defining the program can be found at our web site: <https://www.ans.iastate.edu/undergraduate-students> (<https://www.ans.iastate.edu/undergraduate-students/>). Our program is designed to provide career skills appropriate to job market needs. Our faculty goals include providing superior academic advising to enable students to fulfill their objectives.

## Student Learning Outcomes

Learning outcomes for the Animal and Dairy Science majors dictate that, upon completion of the program, graduates will:

- Demonstrate a comprehensive knowledge of animal science, animal management, and agribusiness
- Exhibit effective communication skills
- Integrate information to solve problems
- Effectively employ skills as a self –learner
- Participate as team leaders and team builders
- Demonstrate awareness of contemporary issues that drive change in animal industries

The department offers the degrees bachelor of science in animal science and bachelor of science in dairy science. A double major in animal and dairy science is not permitted. However, combining either the animal science or dairy science majors with other curricula is permitted. A limit of 6 credits each in Intercollegiate Judging (Animal Science 475), or any independent study course (490 courses) can be applied toward a degree. A limit of 4 credits of Undergraduate Teaching Experience (Animal Science 497) can be applied toward a degree.

The department offers a minor in Animal Science and a minor in Meat Science. Certificates in Beef Cattle Production Management, Swine Production Management, Poultry Production Management, and Equine Management are also offered. Both the animal science curricula and dairy science curricula allow complementary work toward admission to veterinary medical school and other professional schools, which may be

done while satisfying requirements for the bachelor of science degree. A program that combines bachelor of science and master of science in animal science is offered. In addition, a program that combines a bachelor of science and master of business administration is offered. The Department facilitates student participation in the Midwest Poultry Consortium and the Swine Science Online program to offer additional training in poultry and swine production, respectively.

## Curriculum in Animal Science

Students majoring in animal science will complete the degree requirements listed below. If desired, a student may also choose a specialized option. To earn a degree in Animal Science from Iowa State University a minimum of 15 credits in Animal Science must be earned from courses taught in the Animal Science department at ISU. A minimum of 15 credits of animal science coursework must be earned at Iowa State University.

### Total Degree Requirement: 128 cr.

Only 65 cr. from a two-year institution may apply which may include up to 16 technical cr.; 9 P-NP cr. of free electives; 2.00 minimum GPA.

### International Perspectives

Approved International Perspectives course 3

### U.S. Diversity

Approved U. S. Diversity course 3

### Communications Proficiency (with a C or better)

English composition 6

Speech fundamentals 3

**Total Credits 9**

### Communication/Library

ENGL 150 Critical Thinking and Communication 3

ENGL 250 Written, Oral, Visual, and Electronic Composition 3

LIB 160 Introduction to College Level Research 1

One course from the following: 3

SP CM 212 Fundamentals of Public Speaking

AGEDS 311 Presentation and Sales Strategies for Agricultural Audiences

AGEDS 327 Survey of Agriculture and Life Sciences Communication

COMST 214 Professional Communication

One course from the following: 3

ENGL 302 Business Communication

ENGL 309 Proposal and Report Writing

ENGL 312 Communicating Science and Public Engagement

ENGL 314	Technical Communication	
<b>Total Credits</b>		<b>13</b>
<b>Humanities and Social Sciences</b>		
Approved Humanities course		3
Approved Social Science course		3
<b>Total Credits</b>		<b>6</b>
<b>Ethics</b>		
Approved Ethics course		3
<b>Mathematical Sciences</b>		
One course from the following:		3-4
MATH 140	College Algebra	
MATH 150	Discrete Mathematics for Business and Social Sciences	
MATH 160	Survey of Calculus	
MATH 165	Calculus I	
One course from the following:		3-4
STAT 101	Principles of Statistics	
STAT 104	Introduction to Statistics	
STAT 226	Introduction to Business Statistics I	
<b>Total Credits</b>		<b>6-8</b>
<b>Physical Sciences</b>		
A minimum of 8 credits are required. These requirements are specific to option and are listed with each option below.		
<b>Biological Sciences</b>		
BIOL 211	Principles of Biology I	3
BIOL 211L	Principles of Biology Laboratory I	1
BIOL 212	Principles of Biology II	3
BIOL 212L	Principles of Biology Laboratory II	1
BIOL 313	Principles of Genetics	3
or GEN 320	Genetics, Agriculture and Biotechnology	
MICRO 201 & 201L	Introduction to Microbiology and Introductory Microbiology Laboratory	3-4
or MICRO 302 & 302L	Biology of Microorganisms and Microbiology Laboratory	
<b>Total Credits</b>		<b>14-15</b>
<b>Business</b>		
One course from the following:		3
ACCT 284	Financial Accounting	
ECON 101	Principles of Microeconomics	
ECON 102	Principles of Macroeconomics	
<b>Total Credits</b>		<b>3</b>

**Animal Science Core**

AN S 101	Working with Animals	2
AN S 110	Orientation in Animal Science and ISU	1
AN S 114	Survey of the Animal Industry	2
AN S 210	Career Preparation in Animal Science	1
AN S 211	Issues Facing Animal Science	1
AN S 214	Domestic Animal Physiology	3
AN S 214L	Domestic Animal Anatomy and Physiology Lab	1
AN S 319	Animal Nutrition	3
AN S 320	Animal Feeds and Feeding	3
AN S 331	Domestic Animal Reproduction	3
AN S 352	Genetic Improvement of Domestic Animals	3
AN S 411	Addressing Issues in Animal Science	1

**Total Credits** **24****General Animal Science**

CHEM 163 & 163L	College Chemistry and Laboratory in College Chemistry	5
or CHEM 177 & 177L	General Chemistry I and Laboratory in General Chemistry I	
CHEM 331	Organic Chemistry I	3
or BBMB 221	Structure and Reactions in Biochemical Processes	

Three courses from the following: 9

AN S 216	Equine Science	
AN S 223	Poultry Science	
AN S 224	Companion Animal Science	
AN S 225	Swine Science	
AN S 226	Beef Cattle Science	
AN S 228	Laboratory Animal Science	
AN S 229	Sheep Science	
AN S 235	Dairy Cattle Science	
AN S 270 & 270L	Foods of Animal Origin and Foods of Animal Origin Laboratory	

One course from the following: 2-4

AN S 313	Exercise Physiology of Animals	
AN S 324	Food Processing for Companion Animals	
AN S 336	Domestic Animal Behavior and Well-Being	
AN S 337	Lactation	
AN S 345	Growth and Development of Domestic Animals	
AN S 360	Fresh Meat Science and Applied Muscle Biology	
BIOL 314	Principles of Molecular Cell Biology	
BIOL 352	Vertebrate Histology	
BIOL 353	Introductory Parasitology	
ENT 372	Livestock Entomology	

ENT 374	Insects and Our Health	
MICRO 310	Medical Microbiology	
VDPAM 487	Livestock Disease Prevention	
TSM 327	Animal Production Systems	
AGRON 334	Forage Crop Management	
One course from the following:		3
AN S 415	Equine Systems Management	
AN S 424	Companion Animal Systems Management	
AN S 425	Swine Systems Management	
AN S 426	Beef Cattle Systems Management	
AN S 429	Sheep Systems Management	
AN S 434	Dairy Systems Management	
One course from the following:		2-3
AN S 415	Equine Systems Management	
AN S 419	Advanced Animal Nutrition	
AN S 424	Companion Animal Systems Management	
AN S 425	Swine Systems Management	
AN S 426	Beef Cattle Systems Management	
AN S 429	Sheep Systems Management	
AN S 434	Dairy Systems Management	
AN S 460	Science and Technology of Value Added Meat Products	
FS HN 410	Food Analysis	
FS HN 420	Food Microbiology	
MICRO 407	Microbiological Safety of Foods of Animal Origins	

**Total Credits** **24-27**

Additional free electives required for Animal Science 23-29

### Pre-Veterinary Medicine Option

BBMB 301	Survey of Biochemistry	3
or BBMB 316	Principles of Biochemistry	
or BBMB 404	Biochemistry I	
or BBMB 420	Mammalian Biochemistry	
CHEM 177	General Chemistry I	4
CHEM 177L	Laboratory in General Chemistry I	1
CHEM 178	General Chemistry II	3
CHEM 331	Organic Chemistry I	3
CHEM 331L	Laboratory in Organic Chemistry I	1
PHYS 131 & 131L	General Physics I and General Physics I Laboratory	5
Three courses from the following:		9
AN S 216	Equine Science	
AN S 223	Poultry Science	

AN S 224	Companion Animal Science	
AN S 225	Swine Science	
AN S 226	Beef Cattle Science	
AN S 228	Laboratory Animal Science	
AN S 229	Sheep Science	
AN S 235	Dairy Cattle Science	
AN S 270 & 270L	Foods of Animal Origin and Foods of Animal Origin Laboratory	
One course from the following:		2-4
AN S 313	Exercise Physiology of Animals	
AN S 324	Food Processing for Companion Animals	
AN S 336	Domestic Animal Behavior and Well-Being	
AN S 337	Lactation	
AN S 345	Growth and Development of Domestic Animals	
AN S 360	Fresh Meat Science and Applied Muscle Biology	
BIOL 314	Principles of Molecular Cell Biology	
BIOL 352	Vertebrate Histology	
BIOL 353	Introductory Parasitology	
ENT 372	Livestock Entomology	
ENT 374	Insects and Our Health	
MICRO 310	Medical Microbiology	
VDPAM 487	Livestock Disease Prevention	
TSM 327	Animal Production Systems	
AGRON 334	Forage Crop Management	
One course from the following:		3
AN S 415	Equine Systems Management	
AN S 424	Companion Animal Systems Management	
AN S 425	Swine Systems Management	
AN S 426	Beef Cattle Systems Management	
AN S 429	Sheep Systems Management	
AN S 434	Dairy Systems Management	
One course from the following:		2-3
AN S 415	Equine Systems Management	
AN S 419	Advanced Animal Nutrition	
AN S 424	Companion Animal Systems Management	
AN S 425	Swine Systems Management	
AN S 426	Beef Cattle Systems Management	
AN S 429	Sheep Systems Management	
AN S 434	Dairy Systems Management	
AN S 460	Science and Technology of Value Added Meat Products	
FS HN 410	Food Analysis	
FS HN 420	Food Microbiology	

MICRO 407	Microbiological Safety of Foods of Animal Origins
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<b>Total Credits</b>	<b>36-39</b>
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Additional free electives required for the Pre-veterinary Medicine Option	8-14
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\* The Iowa State University College of Veterinary Medicine academic requirements are met by completion of this option (<http://vetmed.iastate.edu/academics/prospective-students/admissions/academic-requirements> (<http://vetmed.iastate.edu/academics/prospective-students/admissions/academic-requirements/>)).

**Animal Science, B.S. - GENERAL****Freshman**

Fall	Credits	Spring	Credits
AN S 110	2	1 AN S 114	2
AN S 101	4	2 CHEM 177 or 163	4
BIOL 211	1	3 CHEM 177L or 163L	1
BIOL 211L	3	1 Humanities - elective list	3
ENGL 150	3	3 SP CM 212, AGEDS 311, AGEDS 327, or COMST 214	3
LIB 160	3-4	1 STAT 101, 104, or 226	3-4
MATH 140, 150, 160, or 165	3-4		
Soc. Sci. - elective list	3		
<b>17-18</b>		<b>16-17</b>	

**Sophomore**

Fall	Credits	Spring	Credits
AN S 211	1	1 AN S 210	1
AN S 200 - elective list	3	3 AN S 214	3
AN S 200 - elective list	1	3 AN S 214L	1
BIOL 212	3	3 AN S 200 - elective list	3
BIOL 212L	3	1 ENGL 250	3
BBMB 221	2-3	3 MICRO 201 or 302	2-3
ECON 101, 102, or ACCT 284	1	3 MICRO 201L or 302L	1
	3	Free elective	3
<b>17</b>		<b>17-18</b>	

**Junior**

Fall	Credits	Spring	Credits
AN S 319	3	3 AN S 320	3
AN S 331	3	3 AN S 352	3
GEN 320 or BIOL 313	3	3 AN S 300 - elective list	3
U.S. Diversity - elective list	3	3 Ethics -elective list	3
Free elective	3	3 Free elective	3
<b>15</b>		<b>15</b>	

**Senior**

Fall	Credits	Spring	Credits
AN S 411	3	1 AN S 400 - Option 2	3
AN S 400 - Option 1	3	3 International Perspective - elective list	3
ENGL 302, 309, 312, or 314	3	3 Free elective	3
Free elective	3	3 Free elective	3
Free elective	4	3 Free elective	4
Free elective	3	3	
		<b>16</b>	<b>16</b>

Important: This is only one of many equally-sound schedule sequences.

Note:

Free electives and specified group electives are often chosen to complement the student's career focus. The student's academic advisor assists with developing scheduling schemes that prepare students individually for careers in the animal industry. They are explained fully in AN S 110 and through appointments with the student's advisor.

**Animal Science, B.S. - pre-veterinary medicine****Freshman**

Fall	Credits	Spring	Credits
AN S 110	2	1 AN S 114	2
AN S 101	4	2 CHEM 177	4
BIOL 211	1	3 CHEM 177L	1
BIOL 211L	3	1 Humanities - elective list	3
ENGL 150	3	3 SP CM 212, AGEDS 311, AGEDS 327, or COMST 214	3
LIB 160	3-4	1 STAT 101, 104, or 226	3-4
MATH 140, 150, 160, or 165	3-4		
Soc. Sci. - elective list	3		
		<b>17-18</b>	<b>16-17</b>

**Sophomore**

Fall	Credits	Spring	Credits
AN S 211	1	1 AN S 214	3
AN S 200 - elective list	3	3 AN S 214L	1
AN S 200 - elective list	3	3 AN S 200 - elective list	3
BIOL 212	3	3 CHEM 331	3
BIOL 212L	1	1 CHEM 331L	1
CHEM 178	3	3 ENGL 250	3
ECON 101, 102, or ACCT 284	3	3 Ethics - elective list	3
		<b>17</b>	<b>17</b>

<b>Junior</b>		
<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
AN S 210	1 AN S 320	3
AN S 319	3 AN S 352	3
AN S 331	3 AN S 300 - elective list	3
GEN 320 or BIOL 313	3 BBMB 301, 316, 404, or 420	3
CHEM 332	3 US Diversity - elective list	3
MICRO 201 or 302	2-3	
MICRO 201L or 302L	1	
<b>16-17</b>		<b>15</b>

<b>Senior</b>		
<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
AN S 411	1 AN S 400 - Option 2	3
AN S 400 - Option 1	3 International Perspective - elective list	3
ENGL 302, 309, 312, or 314	3 Free elective	3
PHYS 131	4 Free elective	3
PHYS 131L	1 Free elective	3
Free elective	3	
Free elective	2	
<b>17</b>		<b>15</b>

Important: This is only one of many equally-sound schedule sequences.  
Note:

\* Credits currently required for application to Veterinary Medicine program at ISU (55 credits)

General Chemistry with lab (7)

Organic Chemistry with lab (4)

Biochemistry (3)

General Physics with lab (4)

General Biology with lab (8)

Genetics/Animal Breeding (3)

Mammalian Anatomy and/or Physiology (3)

English Composition (6)

Oral Communication (3)

Humanities and/or Social Sciences (6)

Other Electives (8)

## Minors: Animal Science and Meat Science

All minors require at least 15 credits, including at least 6 credits in courses numbered 300 or above taken at Iowa State University. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement.

The department offers a minor in Animal Science. The minor requires:

AN S 101	Working with Animals	2
AN S 114	Survey of the Animal Industry	2
AN S 214	Domestic Animal Physiology	3
AN S 214L	Domestic Animal Anatomy and Physiology Lab	1
One course from the following:		3
AN S 216	Equine Science	
AN S 223	Poultry Science	
AN S 224	Companion Animal Science	
AN S 225	Swine Science	
AN S 226	Beef Cattle Science	
AN S 229	Sheep Science	
AN S 235	Dairy Cattle Science	
AN S 270 & 270L	Foods of Animal Origin and Foods of Animal Origin Laboratory	
One course from the following:		3
AN S 313	Exercise Physiology of Animals	
AN S 319	Animal Nutrition	
AN S 331	Domestic Animal Reproduction	
AN S 345	Growth and Development of Domestic Animals	
AN S 352	Genetic Improvement of Domestic Animals	
One course from the following:		2-3
AN S 319	Animal Nutrition	
AN S 320	Animal Feeds and Feeding	
AN S 331	Domestic Animal Reproduction	
AN S 324	Food Processing for Companion Animals	
AN S 336	Domestic Animal Behavior and Well-Being	
AN S 337	Lactation	
AN S 345	Growth and Development of Domestic Animals	
AN S 352	Genetic Improvement of Domestic Animals	
AN S 360	Fresh Meat Science and Applied Muscle Biology	
AN S 419	Advanced Animal Nutrition	

**Total Credits** **16-17**

A total of 9 credits must be earned at Iowa State University in animal science coursework that meets a degree requirement for the B.S. degree in animal science. Students interested in the Animal Science minor should contact an Animal Science advisor.

## Minor - Meat Science

The department offers a minor in Meat Science. The minor requires:

AN S 270	Foods of Animal Origin	2
AN S 270L	Foods of Animal Origin Laboratory	1
AN S 360	Fresh Meat Science and Applied Muscle Biology	3

AN S 460	Science and Technology of Value Added Meat Products	3
One course from the following:		1
AN S 489	Issues in Food Safety	
AN S 490C	Independent Study: Meat Science	
5-6 Credits from the following		5-6
AN S 324	Food Processing for Companion Animals	
FS HN 305	Food Quality Management and Control	
FS HN 311	Food Chemistry	
FS HN 403	Food Laws and Regulations	
FS HN 406	Sensory Evaluation of Food	
FS HN 410	Food Analysis	
FS HN 412	Food Product Development	
FS HN 420	Food Microbiology	
FS HN 471	Food Processing	
MICRO 407	Microbiological Safety of Foods of Animal Origins	
<b>Total Credits</b>		<b>15-16</b>

Students majoring in Animal Science will not be allowed to count the 9 required credits (270, 270L, 360, 460) toward their Animal Science degree. Students interested in the Meat Science minor should contact an Animal Science advisor.

The Department of Animal Science offers certificates in:

- Beef Cattle Production Management
- Dairy Cattle Production Management
- Equine Science and Management
- Poultry Production Management
- Swine Production Management

All certificates require at least 24 credits, including at least 18 credits at the 300 or 400 level. At least 9 credits must be unique to the certificate and will not be applied to a major, minor, or another certificate. All courses applied to the certificate must be taken for a grade. A cumulative GPA of 2.0 is required to complete the program and receive the certificate.

## Beef Cattle Production Management

### Foundation Course (3 credits)

AN S 226	Beef Cattle Science	3
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### Fundamental Disciplines in Animal Science (9 credits)

AN S 320	Animal Feeds and Feeding	3
AN S 331	Domestic Animal Reproduction	3
AN S 352	Genetic Improvement of Domestic Animals	3

### Expertise Expansion (3 credits)

AGRON 280	Crop Development, Production and Management	3
AGRON 334	Forage Crop Management	3
AN S 333	Embryo Transfer and Related Technologies	3
AN S 336	Domestic Animal Behavior and Well-Being *	3
AN S 345	Growth and Development of Domestic Animals *	3
AN S 360	Fresh Meat Science and Applied Muscle Biology *	3
TSM 327	Animal Production Systems *	3
TSM 455	Feed Processing and Technology	3
TSM 457	Feed Safety, Ingredient Quality and Analytics	3
VDPAM 487	Livestock Disease Prevention *	3

\* Course fulfills the Animal Science degree discipline expansion requirement unless designated as a unique course in the certificate

### Enterprise Management (3 credits)

AGEDS 451	Agricultural Law	3
ECON 230	Farm Business Management ^	3
ECON 235	Introduction to Agricultural Markets	3
ECON 332	Cooperatives	3
ECON 334	Entrepreneurship in Agriculture	3

^ Course is a prerequisite for AN S 426

### Beef Cattle Production Emphasis (6 credits)

AN S 426	Beef Cattle Systems Management	3
AN S 399A	Animal Science Internship: Graded Internship Experience	3

## Dairy Cattle Production Management Certificate

### Foundation Course (3 credits)

AN S 235	Dairy Cattle Science	3
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### Fundamental Disciplines in Animal Science (9 credits)

AN S 320	Animal Feeds and Feeding	3
AN S 331	Domestic Animal Reproduction	3
AN S 337	Lactation	3

### Expertise Expansion (3 credits)

AGRON 280	Crop Development, Production and Management	3
AGRON 334	Forage Crop Management	3
AN S 333	Embryo Transfer and Related Technologies	3
AN S 335	Dairy Cattle Evaluation	3

AN S 345	Growth and Development of Domestic Animals *	3
AN S 352	Genetic Improvement of Domestic Animals	3
AN S 419	Advanced Animal Nutrition	2
FS HN 407	Microbiological Safety of Foods of Animal Origins	3
MICRO 302	Biology of Microorganisms	3
TSM 327	Animal Production Systems *	3
TSM 455	Feed Processing and Technology *	3
TSM 457	Feed Safety, Ingredient Quality and Analytics *	3

\* Courses fulfill the Animal Science degree discipline expansion requirement unless designated as a unique course in the certificate

#### Enterprise Management (3 credits)

AGEDS 451	Agricultural Law	3
ECON 230	Farm Business Management ^	3
ECON 235	Introduction to Agricultural Markets	3
ECON 332	Cooperatives	3
ECON 334	Entrepreneurship in Agriculture	3
ECON 337	Agricultural Marketing	3

^ Course is a prerequisite for AN S 434

#### Dairy Cattle Production Emphasis (6 credits)

AN S 434	Dairy Systems Management	3
or AN S 435	Applied Dairy Farm Evaluation	
AN S 399A	Animal Science Internship: Graded Internship Experience	3

### Equine Science and Management Certificate

#### Foundation Course (3 credits)

AN S 216	Equine Science	3
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#### Fundamental Disciplines in Animal Science (6 credits)

AN S 320	Animal Feeds and Feeding	3
AN S 331	Domestic Animal Reproduction	3

#### Equine Expertise Expansion (6 credits)

AN S 217	Equine Farm Practicum	2
AN S 306	Equine Evaluation	3
AN S 313	Exercise Physiology of Animals *	3
AN S 317A	Fundamentals of Equine Behavior and Training: Young Horses at Halter	1
AN S 317B	Fundamentals of Equine Behavior and Training: Yearlings	3

AN S 332E	Laboratory Methods in Animal Reproduction: Equine	1
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\* Courses fulfill the Animal Science degree discipline expansion requirement unless designated as a unique course in the certificate

#### Expertise Expansion (3 credits)

ACCT 215	Legal Environment of Business	3
AGEDS 451	Agricultural Law	3
AGRON 334	Forage Crop Management	3
AN S 333	Embryo Transfer and Related Technologies	3
AN S 336	Domestic Animal Behavior and Well-Being *	3
AN S 337	Lactation	3
AN S 345	Growth and Development of Domestic Animals *	3
ECON 320	Labor Economics	3
ECON 334	Entrepreneurship in Agriculture	3

\* Courses fulfill the Animal Science degree discipline expansion requirement unless designated as a unique course in the certificate

#### Equine Management Emphasis (6 credits)

AN S 415	Equine Systems Management	3
AN S 399A	Animal Science Internship: Graded Internship Experience	3

### Poultry Production Management Certificate

#### Foundation Course (3 credits)

AN S 223	Poultry Science	3
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#### Fundamental Disciplines in Animal Science (9 credits)

AN S 320	Animal Feeds and Feeding	3
AN S 331	Domestic Animal Reproduction	3
AN S 352	Genetic Improvement of Domestic Animals	3

#### Expertise Expansion (3 credits)

AN S 336	Domestic Animal Behavior and Well-Being *	3
AN S 345	Growth and Development of Domestic Animals *	3
AN S 360	Fresh Meat Science and Applied Muscle Biology *	3
TSM 327	Animal Production Systems *	3
TSM 455	Feed Processing and Technology	3
TSM 457	Feed Safety, Ingredient Quality and Analytics	3
VDPAM 487	Livestock Disease Prevention *	3
AN S 373A	Poultry Products Technology #	3
AN S 373B	Applied Avian Physiology #	3

AN S 373C	Avian Health #	3
AN S 373D	Poultry Nutrition #	3

\* Courses fulfill the Animal Science degree discipline expansion requirement unless designated as a unique course in the certificate

# Courses are held as part of the Midwest Poultry Consortium COE courses during the summer

#### Enterprise Management (3 credits)

AGEDS 451	Agricultural Law	3
ECON 230	Farm Business Management	3
ECON 235	Introduction to Agricultural Markets	3
ECON 332	Cooperatives	3
ECON 334	Entrepreneurship in Agriculture	3

#### Poultry Production Emphasis (6 credits, to include AN S 399 and choice of one 400-level management)

AN S 399A	Animal Science Internship: Graded Internship Experience	3
AN S 473A	Poultry Enterprise Management #	3
AN S 473B	Breeder Flock and Hatchery Management #	3

# Courses are held as part of the Midwest Poultry Consortium COE courses during the summer

## Swine Production Management Certificate

### Foundation Course (3 credits)

AN S 225	Swine Science	3
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### Fundamental Disciplines in Animal Science (9 credits)

AN S 320	Animal Feeds and Feeding	3
AN S 331	Domestic Animal Reproduction	3
AN S 352	Genetic Improvement of Domestic Animals	3

### Expertise Expansion (3 credits)

AGRON 280	Crop Development, Production and Management	3
AN S 333	Embryo Transfer and Related Technologies	3
AN S 336	Domestic Animal Behavior and Well-Being *	3
AN S 345	Growth and Development of Domestic Animals *	3
AN S 360	Fresh Meat Science and Applied Muscle Biology *	3
AN S 380C	Employee Management for the Swine Industry	1
AN S 380D	Farrowing Management	1
AN S 380E	Swine Feed Mill Management	1

AN S 380F	Marketing and Risk Management in the Swine Industry	1
AN S 380G	Swine Nursery and Finishing Management	1
AN S 382	Swine Environment Management	1
AN S 383	Swine Manure and Nutrient Management	1
AN S 384	Swine Health and Biosecurity	1
TSM 327	Animal Production Systems *	3
TSM 455	Feed Processing and Technology	3
TSM 457	Feed Safety, Ingredient Quality and Analytics	3
VDPAM 487	Livestock Disease Prevention *	3

\* Courses fulfill the Animal Science degree discipline expansion requirement unless designated as a unique course in the certificate

#### Enterprise Management (3 credits)

AGEDS 451	Agricultural Law	3
ECON 230	Farm Business Management	3
ECON 235	Introduction to Agricultural Markets	3
ECON 332	Cooperatives	3
ECON 334	Entrepreneurship in Agriculture	3

#### Swine Production Emphasis (6 credits)

AN S 425	Swine Systems Management	3
AN S 399A	Animal Science Internship: Graded Internship Experience	3

## Graduate Study

The department offers work for the degrees master of science and doctor of philosophy with majors in animal breeding and genetics; meat science; animal physiology; animal science; and an interdepartmental program in nutritional sciences which has an option in animal nutrition. Minor work is offered in these areas to students taking major work in other departments.

A strong undergraduate program is required for students interested in graduate study. Fundamental training in biology, chemistry, mathematics, and statistics is requisite to a satisfactory graduate program. Graduate programs in animal science include supporting work in areas such as agricultural engineering, agronomy; anatomy; biochemistry; chemistry; economics; environmental science; food science and human nutrition; genetics; microbiology; physics; physiology; and statistics. Students may choose graduate programs involving a co-major with one of these areas. Graduate work in meat science is offered as a co-major in animal science and food science and human nutrition.

The department also cooperates in the interdepartmental program in professional agriculture and interdepartmental majors



in genetics, immunobiology, microbiology, MCDB (molecular, cellular, and developmental biology), neuroscience, nutritional sciences, and toxicology (see Index (<http://catalog.iastate.edu/previouscatalogs/2022-2023/azindex/>)).

The foreign language requirement, if any, is established on an individual basis by the program-of-study committee appointed to guide the work of the student.