MICHIGAN STATE
UNIVERSITY

January 5, 2009

MEMORANDUM

TO: Dr. Douglas Estry, Associate Provost for Undergraduate Education and Dean of Undergraduate Studies

FROM: Dr. Linda O. Stanford, Associate Provost for Academic Services

RE: Request to Require a Grade-Point Average of 3.00 in for Admission into the Production Animal Scholars concentration in the Bachelor of Science Degree in Animal Science

For Transmittal to the University Committee on Academic Policy (UCAP)

The request referenced above is being sent to you for action by the University Committee on Academic Policy (UCAP).

UCAP Response Requested:

Please ask the UCAP to consider the request referenced above at its meeting on January 15, 2009. Please mail the related materials referenced under the heading Attachments at the end of this memorandum to the members of the UCAP.

The academic program and course requests referenced above will be included on the agenda for the January 22, 2009 meeting of Subcommittee A, University Committee on Curriculum (UCC). Requests that are approved by Subcommittee A on January 22 will be before the Full Committee, UCC, for action on February 5, 2009. Requests that are approved by the Full Committee on February 5 will be included in the February 24, 2009, Report of the UCC to the Academic Council.

If you have any questions about this memorandum or the attached materials, please call me at 5-8420.

Thank you for your help.

Attachments:

1. Request for Changes in an Academic Program form dated November 24, 2008 for the Bachelor of Science Degree in Animal Science and attachments.

UNIVERSITY CURRICULUM and CATALOG

Michigan State University
176 Administration Building
East Lansing, Michigan
48824-1046

PH: 517/355-8420
FAX: 517/353-1935

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Insert (1)

Graduates may be employed in farm ownership, management, marketing, agribusiness, finance, manufacturing, public relations, extension, or consulting.

Insert (2)

Students must choose from one of the following concentrations: animal industry, companion and exotic animal biology, animal biology/preveterinary, or production animal scholars.

The animal industry concentration is designed to prepare students for careers in managing animal operations. Marketing, sales, and production of animals and animal products offer numerous employment opportunities.

The companion and exotic animal biology concentration prepares students for careers in the areas of small animal nutrition, pet food sales, and captive and small animal management. Students may also use their elective credits to complete the preveterinary requirements and apply to the College of Veterinary Medicine.

The animal biology/preveterinary concentration is designed for students who are interested in an advanced degree in animal science or a career in veterinary medicine. The requirements for admission to the College of Veterinary Medicine are included in the requirements for this concentration.

The production animal scholars concentration is a cooperative effort between the Department of Animal Science and the College of Veterinary Medicine. The concentration is for students committed to a career in food animal management and medicine and provides an admissions pathway to Production Medicine Scholars in the College of Veterinary Medicine. Students must (1) declare the concentration when they reach junior standing; (2) submit a formal application for the production animal scholars concentration; (3) have a minimum cumulative grade-point average of 3.00 for admission to the concentration; and (4) demonstrate a commitment to livestock agriculture, excluding horses, through youth activities, family experiences, employment, internships, extracurricular activities, and other participation in the livestock industry.

After completion of the production animal scholars concentration, students will earn a Bachelor of Science degree in Animal Science. Students may then enter veterinary college or pursue a career in farm-based, agricultural veterinary practice. Students completing this concentration must complete the Bachelor of Science degree in Animal Science prior to matriculation into the College of Veterinary Medicine. Students interested in pursuing the admissions pathway to Production Medicine Scholars in the College of Veterinary Medicine should see the *College of Veterinary Medicine* section of this catalog for further information.

Insert (3)

b. One of the following courses: 3 or 4

STT	200	Statistical Methods	3
STT	201	Statistical Methods	4
STT	421	Statistics I	3
STT	464	Statistics for Biologists	3

COLLEGE OF AGRICULTURE AND NATURAL RESOURCES

1. Request to change the requirements for the **Bachelor of Science** degree in **Animal Science** in the Department of Animal Science as published on pages 123 and 124 of the 2007-2009 *Academic Programs* catalog. The University Committee on Academic Policy will consider this request at its January 15, 2009 meeting.

a. Under the heading **Requirements for the Bachelor of Science Degree in Animal Science** make the following changes:

(1) In item 3. a make the following changes:

(a) Change the total credits from '30' to '29'.

(b) Delete the following courses:

ANS	210	Animal Products	4

(c) Add the following courses:

ANS	101	Professional Development in Animal Science I	1
ANS	301	Professional Development in Animal Science II	2

(2) Reletter item 3. b, 3. c and 3.d. to items 3. c., 3. d., and 3.e. respectively.

(3) Add the following item 3. b.:

b.	One of the following courses:			3 or 4
	STT	200	Statistical Methods	3
	STT	201	Statistical Methods	4
	STT	421	Statistics I	3
	STT	464	Statistics for Biologists	3

(4) In item 3. c. delete the following statement:

A student who selects the **Preveterinary** concentration is required to complete Chemistry 251 to satisfy requirement 3. b.

(5) Change item 3. d. to 'One of the following courses' and add the following course:

ANS	282	Introductory Companion Animal Management	3

(6) Replace item 3. e. with the following:

One of the following concentrations:				23 to 55
Animal Industry (23 to 34 credits)				
1.	The following course (4 credits):			
	ANS	210	Animal Products	4
2.	One of the following courses (2 or 3 credits):			
	CSE	101	Computing Concepts and Competencies	3
	CSS	110	Computer Applications in Agronomy	2
3.	One of the following courses (3 credits):			
	ABM	100	Decision-making in the Agri-Food System	3
	ABM	130	Farm Management I	3
4.	One of the following courses (3 credits):			
	ANS	222	Introductory Beef Cattle Management	3
	ANS	232	Introductory Dairy Cattle Management	3
	ANS	242	Introductory Horse Management	3
	ANS	252	Introduction to Management of Avian Species	3
	ANS	262	Introductory Sheep Management	3
	ANS	272	Introductory Swine Management	3
	ANS	282	Companion Animal Biology and Management	3

The course used to fulfill this requirement may not be used to fulfill requirement 3. d. above.

5. One of the following courses (3 credits):

ANS	422	Advanced Beef Cattle Management	3
ANS	432	Advanced Dairy Cattle Management	3
ANS	442	Advanced Horse Management	3
ANS	472	Advanced Swine Management	3
ANS	482	Advanced Companion Animal Management	3

6. Three of the following courses (6 to 12 credits):

ANS	305	Applied Animal Behavior	3
ANS	309	Health and Hygiene of Livestock	3
ANS	404	Advanced Animal Genetics	2
ANS	405	Endocrinology of Reproduction	4
ANS	406	Animal Welfare: Science and Society	3
ANS	407	Food and Animal Toxicology	3
ANS	413	Monogastric Animal Nutrition	3
ANS	414	Advanced Animal Breeding	2
ANS	415	Growth and Musculoskeletal Biology	3
ANS	416	Meat Science and Muscle Biology	2
ANS	418	Comprehensive Nutrient Management Planning	3
ANS	435	Mammary Physiology	4
ANS	445	Equine Exercise Physiology	4
ANS	455	Avian Physiology	4
ANS	483	Ruminant Nutrition	3

7. One of the following courses (2 to 6 credits):

ANS	493	Professional Internship in Animal Science	3
ANS	300A	Advanced Livestock Judging	2
ANS	300C	Advanced Dairy Cattle Judging	2
ANS	300D	Advanced Horse Judging	2

Six credits in an approved Study Abroad program can be used to fulfill this requirement.

Animal Biology and Preveterinary (39 to 50 credits)

1. All of the following courses (22 credits):

ANS	210	Animal Products	4
ANS	425	Principles of Animal Biotechnology	3
BMB	401	Basic Biochemistry	4
BS	110	Organisms and Populations	4
CEM	161	Chemistry Laboratory I	1
CEM	252	Organic Chemistry II	3
CEM	255	Organic Chemistry Laboratory	2

2. Three of the following courses (7 to 11 credits):

ANS	404	Advanced Animal Genetics	2
ANS	405	Endocrinology of Reproduction	4
ANS	413	Monogastric Animal Nutrition	3
ANS	415	Growth and Musculoskeletal Biology	3
ANS	416	Meat Science and Muscle Biology	2
ANS	435	Mammary Physiology	4
ANS	483	Ruminant Nutrition	3

3. A minimum of 8 credits from the following courses (8 to 12 credits):

ANS	305	Applied Animal Behavior	3
ANS	309	Health and Hygiene of Livestock	3
ANS	406	Animal Welfare: Science and Society	3
ANS	407	Food and Animal Toxicology	3
ANS	414	Advanced Animal Breeding	2
ANS	418	Comprehensive Nutrient Management Planning	3
ANS	445	Equine Exercise Physiology	4
ANS	455	Avian Physiology	4
MMG	301	Introductory Microbiology	3
MMG	302	Introductory Laboratory for General and Allied Health Microbiology	1
MMG	409	Eucaryotic Cell Biology	3
PHM	450	Introduction to Chemical Toxicity	3

	PHY	231	Introductory Physics I	3
	PHY	232	Introductory Physics II	3
	PHY	251	Introductory Physics Laboratory I	1
	PHY	252	Introductory Physics Laboratory II	1
	ZOL	313	Animal Behavior	3
	ZOL	341	Fundamental Genetics	4

4. One of the following courses (3 to 6 credits):

ANS	492	Undergraduate Research in Animal Science	3
ANS	493	Professional Internship in Animal Science	3

Six credits in an approved Study Abroad program can be used to fulfill This requirement.

Companion and Exotic Animal Biology (43 to 52 credits)

1. All of the following courses (19 credits):

ANS	282	Companion Animal Biology and Management	3
ANS	482	Advanced Companion Animal Management	3
BS	110	Organisms and Populations	4
CEM	252	Organic Chemistry II	3
CEM	255	Organic Chemistry Laboratory	2
ZOL	328	Comparative Anatomy and Biology of Vertebrates (W)	4

2. One of the following courses (4 credits):

BMB	200	Introduction to Biochemistry	4
BMB	401	Basic Biochemistry	4

3. Two of the following courses (6 to 8 credits):

ANS	305	Applied Animal Behavior	3
ANS	405	Endocrinology of Reproduction	4
ANS	413	Monogastric Animal Nutrition	3
ANS	435	Mammary Physiology	4
ANS	483	Ruminant Nutrition	3

4. Four of the following courses (11 to 15 credits):

ANS	404	Advanced Genetics	2
ANS	406	Animal Welfare: Science and Society	3
ANS	407	Food and Animal Toxicology	3
ANS	415	Growth and Musculoskeletal Biology	3
ANS	418	Comprehensive Nutrient Management Planning	3
ANS	425	Principles of Animal Biotechnology	3
ANS	445	Equine Exercise Physiology	4
ANS	455	Avian Physiology	4
ZOL	313	Animal Behavior	3
ZOL	341	Fundamental Genetics	4
ZOL	355	Ecology	3
ZOL	369	Introduction to Zoo and Aquarium Science	3

5. One of the following courses (3 to 6 credits):

ANS	492	Undergraduate Research in Animal Science	3
ANS	493	Professional Internship in Animal Science	3

Six credits in an approved Study Abroad program can be used to fulfill This requirement.

Production Animal Scholars (52 to 55 credits):

1. All of the following courses (33 credits):

ANS	210	Animal Products	4
BMB	401	Basic Biochemistry	4
BS	110	Organisms and Populations	4
CEM	161	Chemistry Laboratory I	1
CEM	252	Organic Chemistry II	3
CEM	255	Organic Chemistry Laboratory	2
MMG	301	Introductory Microbiology	3
MMG	302	Introductory Laboratory for General and Allied Health Microbiology	1
MMG	409	Eucaryotic Cell Biology	3
PHY	231	Introductory Physics I	3
PHY	232	Introductory Physics II	3
PHY	251	Introductory Physics Laboratory I	1
PHY	252	Introductory Physics Laboratory II	1

2. One of the following courses (3 credits):

ANS	222	Introductory Beef Cattle Management	3
ANS	232	Introductory Dairy Cattle Management	3
ANS	252	Introduction to Management of Avian Species	3
ANS	262	Introductory Sheep Management	3
ANS	272	Introductory Swine Management	3

The course used to fulfill this requirement may not be used to fulfill requirement 3. d. above.

3. Two of the following courses (6 credits):

ABM	435	Financial Management in the Agri-Food System	3
ABM	437	Agribusiness Strategic Management (W)	3
ANS	413	Monogastric Animal Nutrition	3
ANS	483	Ruminant Nutrition	3

4. One of the following courses (3 to 4 credits):

ANS	305	Applied Animal Behavior	3
ANS	405	Endocrinology of Reproduction	4
ANS	415	Growth and Musculoskeletal Biology	3
ANS	425	Principles of Animal Biotechnology	3
ANS	435	Mammary Physiology	4

5. One of the following courses (3 credits):

ANS	422	Advanced Beef Cattle Management	3
ANS	432	Advanced Dairy Cattle Management	3
ANS	472	Advanced Swine Management	3

6. One of the following courses (2 to 4 credits):

ANS	404	Advanced Animal Genetics	2
ANS	407	Food and Animal Toxicology	3
ANS	414	Advanced Animal Breeding	2
ANS	416	Meat Science and Muscle Biology	2
ANS	418	Comprehensive Nutrient Management Planning	3
ANS	455	Avian Physiology	4
ZOL	313	Animal Behavior	3
ZOL	341	Fundamental Genetics	4

7. The following course (2 credits):

ANS	390	Animal Science Practicum	2

View a Program

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Joy Speas, RO | Wednesday, 11/26/2008

Program Name: Animal Science Degree Name: BS Sequence Number: 2

Effective Dates: Fall 2008 - Open Status: Interim Initial Action: Change

Requested Date: 11/26/2007 2:40:43 PM

1. Department/School/College:
02063 .... Department of Animal Science

2. Name of Program:
Animal Science

3. Name of Degree:
BS

4. Type of Program:
Major

5. Effective Start Semester:
Fall 2008

6. Target student audience for the program:
Students in the CANR

7. Enrollment:
What is the expected enrollment per year:
350
What is the minimum enrollment acceptable:
200

8. Source of budget for the program:
Internal

9. Projected Costs as compared to other programs in unit:
Same

10. Staff requirement:
How many additional staff will be required:
0
Who will provide the primary instruction. Describe any external linkages(industry, government, etc.):
Faculty of the Department of Animal Science/College of Agriculture and Natural Resources. Industry has served in an advisory capacity in the development of the new curriculum. Internships, field trips and continual monitoring of that effectiveness of the curriculum with assistance from the industry advisory committee.

11. Will additional equipment be required:
Approximate cost:
0
Source of funding:

12. Will additional library materials be required:

Approximate cost:
0
Source of funding:
Present resources are adequate.

13. Will additional space be required:
Type:

Approximate amount:

14. If the program requirements contain a named concentration, do you wish for the concentration to be noted on the student's transcript?:
Yes

15. Detailed Description:

15. a. The current programs in Animal Science have effectively served the needs of majors since their development in the early 1990s. It has become evident that student and industry needs have changed in recent years. After extensive faculty discussion and review a new curriculum has evolved that better prepares students for potential careers in the animal industry and professional and advanced degrees. The proposed curriculum strengthens the science-based options and develops greater understanding and expertise in the disciplines related to Animal Science.

b. The current curriculum in Animal Science needs to be updated to prepare students for a changing animal industry.

c. The Department of Animal Science has provided educational opportunities for students interested in careers in the Animal Industries and has a long history of providing this service to the state of Michigan and Michigan State University.

d. Undergraduate Programs in the Department of Animal Science strive to provide a quality education associated with animal agriculture and industry using a strong science-based curriculum. The proposed changes parallel those in other programs in the CANR by using established science-based coursework and the wise use of our natural resources and applying them to specific biological systems to provide food, recreation and companionship for Michigan, the nation and the world.

e. The entire faculty in the department of Animal Science was involved in the development of the proposed curriculum. It will be the responsibility of the Department Curriculum Committee (elected) and the Department of Animal Science Office of Undergraduate Program (Dr. John Shelle, Coordinator) to implement the proposed changes to the curriculum.

f. Expected enrollment 350. Over the last 10 years the enrollment in the BS programs in Animals Science has ranged from 300 to 350 students. The assumption is that the change in curriculum will not have a negative effect on student numbers and may have a positive result.

g.

h.

Old Academic Program -- shows deletions
DEPARTMENT of
ANIMAL SCIENCE
Karen I. Plaut, Chairperson
UNDERGRADUATE PROGRAM
The undergraduate program in animal science, which leads to the Bachelor of Science degree, is designed to prepare students for a variety of careers by establishing a strong basic science foundation combined with practical experience with agricultural animals

at the multiple farm facilities located near campus. ~~Graduates may be employed in marketing, agribusiness, finance, manufacturing, public relations, as extension specialists, as pharmaceutical salespersons, or as advisers on farm management.~~
Graduates often attend veterinary or graduate school.

Scientific principles of biology and animal science are important components of the program and are combined with opportunities to apply fundamental principles learned in class to farm management. The animal science major also provides students with flexibility. Academic advisers guide students in the development of a planned program of study that is consistent with their interests and goals.

All students in animal science must complete a set of required core courses including breeding and genetics, nutrition, physiology, and management. These principles are taught using horses, dairy cattle, beef cattle, swine, poultry, sheep and companion animals. ~~Students may choose to complete the agribusiness management, preveterinary, production medicine, or science concentration.~~

~~The agribusiness management concentration is designed to prepare students for careers in managing livestock operations. Marketing, sales, and production of livestock and livestock products offer numerous employment opportunities. The preveterinary concentration is designed for students who are interested in careers in veterinary medicine. The requirements for admission to the College of Veterinary Medicine are included in the requirements for this concentration.~~

The production medicine scholars concentration is designed to prepare students for a career in ~~herd-based~~ agricultural veterinary practice. Students interested in the professional program in the College of Veterinary Medicine may apply through a special admissions process. Acceptance in the production medicine scholars concentration does not assure acceptance into the College of Veterinary Medicine. See the *College of Veterinary Medicine* section of this catalog for further information about the admissions pathway for production medicine scholars.

~~The science concentration is designed to prepare students for graduate study and careers in research and animal product development. This concentration includes additional science courses.~~

Students who are enrolled in the Bachelor of Science degree program with a major in animal science may elect a Specialization in Agricultural and Natural Resources Biotechnology. For additional information, refer to the *Specialization in Agricultural and Natural Resources Biotechnology* statement.

Requirements for the Bachelor of Science Degree in Animal Science

1. The University requirements for bachelor's degrees as described in the *Undergraduate Education* section of this catalog; 120 credits, including general elective credits, are required for the Bachelor of Science degree in Animal Science.
The University's Tier II writing requirement for the Animal Science major is met by completing all of the following courses: Animal Science 313, 314, 315. Those courses are referenced in item 3. a. below.

Students who are enrolled in the Animal Science major leading to the Bachelor of Science degree in the Department of Animal Science may complete an alternative track to Integrative Studies in Biological and Physical Sciences that consists of the following courses: Biological Science 111 and 111L, Chemistry 141, and Chemistry 143

or 251. The completion of Biological Science 111L satisfies the laboratory requirement. Biological Science 111 and 111L, Chemistry 141, and Chemistry 143 or 251 may be counted toward both the alternative track and the requirements for the major referenced in item 3. below.

The completion of the College of Agriculture and Natural Resources mathematics requirement may also satisfy the University mathematics requirement.
2. The requirements of the College of Agriculture and Natural Resources for the Bachelor of Science degree.

Certain courses referenced in requirement 3. below may be counted toward College requirements as appropriate.

3. The following requirements for the major:
a. All of the following courses:..... (30)
ANS 110 Introductory Animal Agriculture..... 4
~~ANS 210 Animal Products..... 4~~
ANS 313 Principles of Animal Feeding and Nutrition..... 4
ANS 314 Genetic Improvement of Domestic Animals..... 4
ANS 315 Anatomy and Physiology of Farm Animals..... 4
ANS 401 Issues in Animal Agriculture..... 1
BS 111 Cells and Molecules..... 3
BS 111L Cell and Molecular Biology Laboratory..... 2
CEM 141 General Chemistry..... 4
b. One of the following courses..... 3 or 4
CEM 143 Survey of Organic Chemistry 4
CEM 251 Organic Chemistry I..... 3
A student who selects the **Preveterinary** concentration is required to complete Chemistry 251 to satisfy requirement 3. b.
c. Two of the following species management courses:..... 6
ANS 222 Introductory Beef Cattle Management..... 3
ANS 232 Introductory Dairy Cattle Management..... 3
ANS 242 Introductory Horse Management..... 3
ANS 252 Introduction to Management of Avian Species..... 3
ANS 262 Introductory Sheep Management..... 3
ANS 272 Introductory Swine Management..... 3
d. One of the following concentrations: ..... 24 to 33
~~**Agribusiness Management** ..... (24)~~
~~(1) The requirements for the Specialization in Agribusiness Management as specified in the *Specialization in Agribusiness Management* statement in the *Department of Agricultural Economics* statement (18 credits).~~
~~(2) The following course (3 credits):~~
~~EC 201 Introduction to Microeconomics..... 3~~
~~(3) One of the following courses (3 credits):~~
~~ANS 422 Advanced Beef Cattle Feedlot Management..... 3~~
~~ANS 432 Advanced Dairy Cattle Management..... 3~~
~~ANS 442 Advanced Horse Management..... 3~~
~~ANS 472 Advanced Swine Management ..... 3~~
~~**Preveterinary**..... (33)~~
~~(1) All of the following courses (27 credits):~~
~~BMB 401 Basic Biochemistry..... 4~~
~~BS 110 Organisms and Populations..... 4~~
~~CEM 161 Chemistry Laboratory I ..... 1~~
~~CEM 252 Organic Chemistry II ..... 3~~
~~CEM 255 Organic Chemistry Laboratory ..... 2~~
~~MTH 116 College Algebra and Trigonometry..... 5~~
~~PHY 231 Introductory Physics I ..... 3~~
~~PHY 232 Introductory Physics II..... 3~~
~~PHY 251 Introductory Physics Laboratory I ..... 1~~

~~PHY 252 Introductory Physics Laboratory II..... 1~~
~~(2) At least 6 credits from the following Animal Science courses:~~
~~ANS 305 Applied Animal Behavior..... 3~~
~~ANS 320 Muscle Foods..... 3~~
~~ANS 404 Advanced Genetics of Farm Animals..... 2~~
~~ANS 405 Endocrinology of Reproduction..... 4~~
~~ANS 407 Food and Animal Toxicology..... 3~~
~~ANS 413 Monogastric Animal Nutrition..... 3~~
~~ANS 414 Advanced Animal Breeding..... 2~~
~~ANS 415 Growth and Musculoskeletal Biology..... 3~~
~~ANS 416 Meat Science and Muscle Biology..... 2~~
~~ANS 417 Topics in Toxicology..... 1~~
~~ANS 422 Advanced Beef Cattle Feedlot Management..... 3~~
~~ANS 425 Principles of Animal Biotechnology..... 3~~
~~ANS 427 Environmental Toxicology and Society..... 3~~
~~ANS 432 Advanced Dairy Cattle Management..... 3~~
~~ANS 442 Advanced Horse Management..... 3~~
~~ANS 445 Equine Exercise Physiology..... 4~~
~~ANS 455 Avian Physiology..... 4~~
~~ANS 472 Advanced Swine Management..... 3~~
~~ANS 483 Ruminant Nutrition..... 3~~
~~**Production Medicine Scholars**..... (29 to 33)~~
~~(1) Both of the following courses (9 credits):~~
~~ANS 490 Independent Study..... 6~~
~~CSE 101 Computing Concepts and Competencies..... 3~~
~~(2) Two of the following courses (6 credits):~~
~~ANS 222 Introductory Beef Cattle Management..... 3~~
~~ANS 232 Introductory Dairy Cattle Management..... 3~~
~~ANS 262 Introductory Sheep Management..... 3~~
~~ANS 272 Introductory Swine Management..... 3~~
~~Courses used to fulfill this requirement may also be used to fulfill requirement 3.c.~~

AGRICULTURE AND NATURAL RESOURCES

(3) Two of the following courses (6 or 7 credits):
ABM 435 Financial Management in the Agri-Food System 3
ABM 437 Agribusiness Strategic Management (W)..... 3
ANS 413 Monogastric Animal Nutrition 4
ANS 483 Ruminant Nutrition 3
(4) One of the following courses (3 or 4 credits):
ANS 305 Applied Animal Behavior..... 3
ANS 415 Growth and Musculoskeletal Biology..... 3
ANS 405 Endocrinology of Reproduction..... 4
ANS 425 Principles of Animal Biotechnology..... 3
(5) One of the following courses (3 credits):
ANS 422 Advanced Beef Cattle Feedlot Management..... 3
ANS 432 Advanced Dairy Cattle Management..... 3
ANS 472 Advanced Swine Managemen..... 3
(6) One of the following courses (2 to 4 credits):
ANS 404 Advanced Genetics of Farm Animals..... 2
ANS 407 Food and Animal Toxicology..... 3
ANS 414 Advanced Animal Breeding..... 2
ANS 416 Meat Science and Muscle Biology..... 2
~~ANS 464 Statistics for Biologists..... 3~~
~~STT 201 Statistical Methods..... 4~~
ZOL 313 Animal Behavior 3
ZOL 341 Fundamental Genetics..... 4
~~**Science**..... (24)~~
~~(1) The following course (4 credits):~~
~~STT 201 Statistical Methods..... 4~~
~~(2) One of the following courses (4 credits):~~

~~BMB 200 Introduction to Biochemistry ..... 4~~
~~BMB 401 Basic Biochemistry ..... 4~~
~~(3) At least 16 credits from the following courses, including at least 6 credits in Animal Science courses:~~
~~ANS 305 Applied Animal Behavior ..... 3~~
~~ANS 320 Muscle Foods ..... 3~~
~~ANS 404 Advanced Genetics of Farm Animals ..... 2~~
~~ANS 405 Endocrinology of Reproduction ..... 4~~
~~ANS 407 Food and Animal Toxicology ..... 3~~
~~ANS 413 Monogastric Animal Nutrition ..... 3~~
~~ANS 414 Advanced Animal Breeding ..... 2~~
~~ANS 415 Growth and Musculoskeletal Biology ..... 3~~
~~ANS 416 Meat Science and Muscle Biology ..... 2~~
~~ANS 417 Topics in Toxicology ..... 1~~
~~ANS 425 Principles of Animal Biotechnology ..... 3~~
~~ANS 427 Environmental Toxicology and Society ..... 3~~
~~ANS 445 Equine Exercise Physiology ..... 4~~
~~ANS 455 Avian Physiology ..... 4~~
~~ANS 483 Ruminant Nutrition ..... 3~~
~~BS 110 Organisms and Populations ..... 4~~
~~CEM 161 Chemistry Laboratory I ..... 1~~
~~CEM 252 Organic Chemistry II ..... 3~~
~~CSE 101 Computing Concepts and Competencies ..... 3~~
~~CSE 131 Technical Computing and Problem Solving . . 3~~
~~MMG 201 Fundamentals of Microbiology ..... 3~~
~~PHY 231 Introductory Physics I ..... 3~~
~~PSL 250 Introductory Physiology ..... 4~~
~~STT 464 Statistics for Biologists I ..... 3~~
~~ZOL 313 Animal Behavior ..... 3~~
~~ZOL 341 Fundamental Genetics ..... 4~~
~~Students who pass a waiver examination for Computer Science and Engineering 101 may *not* use Computer Science and Engineering 101 to satisfy the requirements for the **Science** concentration.~~

New Academic Program -- new sections or courses in bold

DEPARTMENT of ANIMAL SCIENCE

Karen I. Plaut, Chairperson

Undergraduate Program

The undergraduate program in animal science, which leads to the Bachelor of Science degree, is designed to prepare students for a variety of careers by establishing a strong basic science foundation combined with practical experience with agricultural animals at the farm facilities located near campus. **Graduates may be employed in farm ownership, management, marketing, agribusiness, finance, manufacturing, public relations, extension, or consulting.** Graduates often attend veterinary or graduate school.

Scientific principles of animal biology are important components of the program and are combined with opportunities to apply fundamental principles learned in

class to animal management. The animal science major also provides students with flexibility. Academic advisers guide students in the development of a planned program of study that is consistent with their interests and goals.

All students in animal science must complete a set of required core courses including breeding and genetics, nutrition, physiology, and management. These principles are taught using horses, dairy cattle, beef cattle, swine, poultry, sheep, and companion animals. **Students must choose from one of the following concentrations: the animal industry, companion and exotic animal biology, animal biology/preveterinary, or production animal scholars.**

The Animal Industry concentration is designed to prepare students for careers in managing animal operations. Marketing, sales, and production of animals and animal products offer numerous employment opportunities.

The Companion and Exotic Animal Biology concentration prepares students for careers in the areas of small animal nutrition, pet food sales, captive and small animal management, and graduate study. Students may also use their elective credits to complete the preveterinary requirements and apply to the College of Veterinary Medicine.

The Animal Biology/Preveterinary concentration is designed for students who are interested in advanced degree in Animal Science or a career in veterinary medicine. The requirements for admission to the College of Veterinary Medicine are included in the requirements for this concentration.

PRODUCTION ANIMAL SCHOLARS CONCENTRATION is a cooperative program between Production Animal Scholars in the Department of Animal Science and Production Medicine Scholars in the College of Veterinary Medicine. These programs are for students committed to a career in food animal management and medicine. Production Animal Scholars provides a special admissions pathway to Production Medicine Scholars in CVM.
After completion of the Production Animal Scholars concentration, students will earn a Bachelor of Science (B.S.) degree in Animal Science. Students may enter veterinary college or pursue a career in farm-based, agricultural veterinary practice. Production Animal Scholars must complete their Animal Science degree before matriculation into CVM. Alternatively, Production Animal Scholars may

pursue non-veterinary careers in animal management, agribusiness or graduate education.
Production Medicine Scholars: See College of Veterinary Medicine (CVM) for information about application, admission, and professional programs.

Students in the Production Animal Scholars concentration must:

1. **Declare a concentration in Animal Science when they reach junior standing**
2. **Submit a formal application for Production Animal Scholars.**
3. **Have a minimum cumulative grade point average of 3.0 for admission into the ~~program~~.** concentration
4. **Demonstrate a commitment to livestock agriculture (excluding horses) through youth activities, family experiences, employment, internships, extracurricular activities, and other participation in the livestock industry.**

Students who are enrolled in the Bachelor of Science degree program with a major in animal science may elect a Specialization in Agricultural and Natural Resources Biotechnology or **~~Agribusiness Management~~**. For additional information, refer to the *Specialization in Agricultural and Natural Resources Biotechnology* or *Agricultural Economics/Agribusiness Management Specialization* statement.

Requirements for the Bachelor of Science Degree in Animal Science

1. The university requirements for bachelor's degrees as described in the *Undergraduate Education* section of this catalog; 120 credits, including general elective credits, are required for the Bachelor of Science degree in Animal Science.

   The University Tier II writing requirement for the Animal Science major is met by completing all of the following courses: Animal Science 313,314,315. Those courses are referenced in item 3.a. below.

   Students who are enrolled in the Animal Science major leading to the Bachelor of Science degree in the Department of Animal Science may complete an alternative track to integrative Studies in Biological and Physical Sciences that consists of the following courses: Biological Science 111 and 111L, Chemistry 141, and Chemistry 143 or 251. The completion of Biological Science 111L satisfies the laboratory requirement. Biological Science 111, 111L, Chemistry 141, and Chemistry 143 or 251 may be counted toward both the alternative track and the requirements for the major referenced in item 3. below.

   The completion of the College of Agriculture and Natural Resources mathematics requirement will also satisfy the University mathematics requirement.
2. The requirements for the College of Agriculture and Natural Resources for the Bachelor of Science degree.

   Certain courses referenced in requirement 3. below may be counted toward

College requirements as appropriate.

3. The following requirements for the major:

CREDITS

a. All of the following courses:..... Professional Development in Animal Science I ~~38 to 40~~ 39

ANS 101 ~~Introduction to Animal Science~~ 1

ANS 110 Introductory Animal Agriculture..... 4

ANS 301 Professional Development in Animal Science II 2

ANS 313 Principles of Animal Feeding and Nutrition..... 4

ANS 314 Genetic Improvement of Domestic Animals..... 4

ANS 315 Anatomy & Physiology of Farm Animals..... 4

ANS 401 Ethical Issues in Animal Agriculture..... 1

BS 111 Cells and Molecules..... 3

BS 111L Cell and Molecular Laboratory..... 2

CEM 141 General Chemistry..... 4

b. One of the following courses:..... 3 to 4

STT 200 Statistical Methods..... 3

STT 201 Statistical Methods..... 4

STT 421 Statistics I..... 3

STT 464 Statistics for Biologists..... 3

c. One of the following courses:..... 3 to 4

CEM 143 Survey of Organic Chemistry..... 4

CEM 251 Organic Chemistry II..... 3

d. One of the following species management courses:..... 3

ANS 222 Introductory Beef Cattle Management..... 3

ANS 232 Introductory Dairy Cattle Management..... 3

ANS 242 Introductory Horse Management..... 3

ANS 252 Introduction to Management of Avian Species..... 3

ANS 262 Introductory Sheep Management..... 3

ANS 272 Introductory Swine Management..... 3

ANS 282 ~~Introductory~~ Companion Animal Management..... 3

e. One of the following concentrations:.....

Animal Industry..... (25 to 34)

(1) ANS 210 Animal Products..... 4

(2) One of the following..... 3

CSS 110 Computer Applications in Agronomy..... ~~3~~ 2

CSE 101 ~~Introduction to~~ Computing Concepts and Competencies..... 3

(3) One of the following..... 3

ABM 100 Decision-making in the Agri-Food System..... 3

ABM 130 Farm Management I..... 3

(4) One of the following in addition to 3.d. above..... 3

ANS 222 Introductory Beef Cattle Management.....

3

ANS 232 Introductory Dairy Cattle Management..... 3

ANS 242 Introductory Horse Management..... 3

ANS 252 Introduction to Management of Avian Species 3

ANS 262 Introductory Sheep Management..... 3

ANS 272 Introductory Swine Management..... 3

ANS 282 ~~Introductory~~ Companion Animal Bio & Mgmt... 3 Management

(5) One of the following... Beef Cattle Land..... 3

ANS 422 Advanced ~~Feedlot~~ Management..... 3

ANS 432 Advanced Dairy Cattle Management..... 3

ANS 442 Advanced Horse Management..... 3

ANS 472 Advanced Swine Management..... 3

ANS 482 Advanced Companion Animal Management... 3

(6) Three of the following..... 6 to 12

ANS 305 Applied Animal Behavior..... 3
ANS 309 Health and Hygiene of Livestock..... 3
ANS 320 Muscle Foods..... 3
ANS 404 Advanced Genetics..... 2
ANS 405 Endocrinology of Reproduction..... 4
ANS 406 Animal Welfare: Science and Society..... 3
ANS 407 Food and Animal Toxicology..... 3
ANS 413 ~~Non-Ruminant~~ Nutrition..... 3
ANS 414 Advanced Animal Breeding..... 2
ANS 415 Growth and Musculoskeletal Biology..... 3
ANS 416 Meat Science and Muscle Biology..... 2
ANS 418 Comprehensive Nutrient Management..... 3
ANS 435 ~~Lactation and~~ Mammary ~~Biology~~..... 4
ANS 445 Equine Exercise Physiology..... 4
ANS 455 Avian Physiology..... 4
ANS 483 Ruminant Nutrition..... 3

(7) One of the following..... 3 to 6
ANS 493 Professional Internship..... 3
ANS 300A, ~~B~~, C, or D..... 2 ~~3~~
Study Abroad Program..... 6

Animal Biology and PreVeterinary ..... (39 to 54)

All of the following..... 22

(1) ANS 210 Animal Products..... 4
ANS 425 Principles of Biotechnology..... ~~3~~ 4
BS 110 Organisms and Populations..... 4
BMB 401 Biochemistry..... 4
CEM 161 Chemistry Laboratory I..... 1
CEM 252 Organic Chemistry II..... 3
CEM 255 Organic Chemistry Laboratory..... 2

(2) Three of the following..... 7 to 11
ANS 404 Advanced Genetics ~~of Farm Animals~~..... 2
ANS 405 Endocrinology of Reproduction..... 4
ANS 413 ~~Non-Ruminant~~ Nutrition..... 3
ANS 415 Growth and Musculoskeletal Biology..... 3
ANS 416 Meat Science and Muscle Biology..... 2
ANS 435 ~~Lactation and~~ Mammary ~~Biology~~..... 4
ANS 483 Ruminant Nutrition..... 3

(3) Minimum of 8 credits from the following courses..... 8 to 12
(* required for admission to MSU Veterinary Medicine)
ANS 305 Applied Animal Behavior..... 3
ANS 309 Health and Hygiene of Livestock..... 3
ANS 320 Muscle Foods..... 3
ANS 406 Animal Welfare: Science and Society..... 3
ANS 407 Food and Animal Toxicology..... 3
ANS 414 Advanced Animal Breeding..... 2
ANS 418 Comprehensive Nutrient Management..... 3
ANS 445 Equine Exercise Physiology..... 4
ANS 455 Avian Physiology..... 4
*MMG 301 Introductory Microbiology..... 3
*MMG 302 Introductory ~~Microbiology~~ Laboratory..... 1
*MMG 409 Eucaryotic Cell Biology..... 3
PHM 450 Introduction to Chemical Toxicity..... 3
*PHY 231 Introductory Physics I..... 3
*PHY 232 Introductory Physics II..... 3
*PHY 251 Introductory Physics Laboratory I..... 1

*PHY 252 Introductory Physics Laboratory II..... 1
ZOL 313 Animal Behavior..... 3
ZOL 341 Fundamental Genetics..... 4
(4) One of the following..... 3 to 6
492 ANS ~~491~~ Undergraduate Research in Animal Science.. 3
ANS 493 Professional Internship in ~~ANS~~ Animal Science 3
Study Abroad Program..... 6

Companion and Exotic Animal Biology..... (41 to 51)

(1) All of the following..... 17
ANS 282 Companion Animal Biology and Management 3
ANS 482 Advance ~~Comparative~~ Animal Management... 3
BS 110 Organisms and Populations..... ~~3~~ 4
CEM 252 Organic Chemistry II..... 3
CEM 255 Organic Chemistry Laboratory..... 2
ZOL 328 Comparative Anatomy and Biol. of Vertebrates 3 (W) 4
(2) One of the following..... 4
BMB 200 Introduction to Biochemistry..... 4
BMB 401 Basic Biochemistry..... 4
(3) Two of the following..... 6 to 8
ANS 305 Applied Animal Behavior..... 3
ANS 405 Endocrinology of Reproduction..... 4
ANS 413 ~~Non-Ruminant~~ Nutrition.. Monogastric Animal.. 3
ANS 435 ~~Lactation and Mammary Biology~~.. Physiology... 4
ANS 483 Ruminant Nutrition..... 3
(4) Four of the following..... 11 to 16
ANS 404 Advance Genetics..... 2
ANS 406 Animal Welfare: Science and Society..... 3
ANS 407 Food and Animal Toxicology..... 3
ANS 415 Growth and Musculoskeletal Biology..... 3
ANS 418 Comprehensive Nutrient Management. Planning 3
ANS 425 Principles of Biotechnology... ~~Animal~~ 4 3
ANS 445 Equine Exercise Physiology..... 4
ANS 455 Avian Physiology..... 4
ZOL 313 Animal Behavior..... 3
ZOL 341 Fundamental Genetics..... 4
ZOL 355 Ecology..... 3
ZOL 369 Introduction to Zoo and Aquarium Science..... 3
(5) One of the following..... 3 to 6
492 ANS ~~491~~ Undergraduate Research in Animal Science.. 3
ANS 493 Professional Internship in ~~ANS~~ Animal Science 3
Study Abroad..... 6

Production Animal Scholars..... (53 to 55)

All of the following..... 33
(1) ANS 210 Animal Products..... 4
BS 110 Organisms and Populations..... 4
BMB 401 Biochemistry... Basic..... 4
CEM 161 Chemistry Laboratory I..... 1
CEM 252 Organic Chemistry II..... 3
CEM 255 Organic Chemistry Lab.oratory..... 2
MMG 301 Introductory Microbiology..... 3
MMG 302 Introductory ~~Microbiology~~ Laboratory... for General and Allied Health Microbiology 1
MMG 409 Eucaryotic Cell Biology..... 3
PHY 231 Introductory Physics I..... 3
PHY 232 Introductory Physics II..... 3
PHY 251 Introductory Physics Laboratory I..... 1

PHY 252 Introductory Physics Laboratory II..... 1

(2) One of the following in addition to 3.d. above..... 3
ANS 222 Introductory Beef Management..... 3
ANS 232 Introductory Dairy Management..... 3
ANS 252 Introduction to Management of Avian Species..... 3
ANS 262 Introductory Sheep Management..... 3
ANS 272 Introductory Swine Management..... 3

(3) Two of the following..... 6
ABM 435 Financial Management in the Agri-Food System... 3
ABM 437 Agribusiness Strategic Management..... 3
ANS 413 ~~Non-Ruminant~~ Nutrition..... 3
ANS 483 Ruminant Nutrition..... 3

(4) One of the following..... 3 to 4
ANS 305 Applied Animal Behavior..... 3
ANS 405 Endocrinology of Reproduction..... 4
ANS 415 Growth and Musculoskeletal Biology..... 3
ANS 425 Principles of ~~Biotechnology~~..... 3
~~ANS 435 Lactation and Mammary Biology~~..... 4

(5) One of the following..... 3
ANS 422 Advanced Beef ~~Feedlot~~ Management..... 3
ANS 432 Advanced Dairy Cattle Management..... 3
ANS 472 Advanced Swine Management..... 3

(6) One of the following..... 2 to 4
ANS 404 Advanced Genetics..... 2
ANS 407 Food and Animal Toxicology..... 3
ANS 414 Advanced Animal Breeding..... 2
ANS 416 Meat Science and Muscle Biology..... 2
ANS 418 Comprehensive Nutrient Management..... 3
ANS 455 Avian Physiology..... 4
ZOL 313 Animal Behavior..... 3
ZOL 341 Fundamental Genetics..... 4

(7) ANS 390 ~~ANS Field Study in Animal Production & Mgmt~~..... 2

Michigan State University

Assessing Student Outcomes

College: Agriculture and Natural Resources

Department: Animal Science

Program or Major: Animal Science

Program Level: BS

Contact Person: Dennis Banks

Inventory of Written Statements and Plans

1. Do you have a written mission statement or statement of purpose? x yes no

Mission: Advance agriculture using multidisciplinary approaches to generate, teach, disseminate and apply knowledge in animal biology and management.

Vision: Our scholarship encompasses innovative research, development of successful graduates, and engagement of stakeholders to integrate and apply relevant knowledge.

Values:

- We value the land-grant mission upon which Michigan State University was founded.
- We value environmental, economic and social sustainability of agricultural systems.
- We value innovative programs that integrate teaching, research and extension.
- We value equally the scholarly contributions of teaching, research and extension.
- We value a balanced commitment to teaching, research and extension.
- We value communication and partnerships with our agricultural stakeholders and the broader community.
- We value external and internal peer review.
- We value accountability to our stakeholders.
- We value accessibility of agricultural animals for experiential learning and research.
- We value a collegial atmosphere that contributes to the personal well-being and professional development of faculty, staff and students.

Adopted December 19, 2002

2. Do you have a written statement of intended educational outcomes
x yes no
describing what a student should know or be able to do when they have completed this program?

3. Do you have a written method of assessment for measuring student
x yes no
outcomes?

4. Does your program have a separate accreditation process? yes

x no

16. Type(s) of change(s):
Creating new concentrations, modifying some concentrations, and deleting others.

17. Students who will be affected by the proposed changes:
Majors in Animal Science

18. Will the proposed change(s) have a negative impact on students? If so, which ones?:
No

Describe impact and explain what accommodations will be made:

19. Reason(s) for change(s):
Current curriculum is outdated and no longer fills the needs of our current students.

DEPARTMENT LEVEL APPROVAL STATUS

Approved by: Department of Animal Science
11/10/2008 9:08:22 PM by Eunice Foster for Karen I. Plaut, Chairperson

SIGNOFFS STATUS

Signed Off by: College of Veterinary Medicine
11/13/2008 8:48:58 AM by Lori Headley for David Sprecher, Acting Associate Dean

COLLEGE LEVEL APPROVAL STATUS

Approved by: College of Agriculture and Natural Resources
11/24/2008 5:54:45 PM by Eunice Foster for Eunice F. Foster, Associate Dean

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DRAFT

DEPARTMENT of ANIMAL SCIENCE

Karen I. Plaut, Chairperson

UNDERGRADUATE PROGRAM

The undergraduate program in animal science, which leads to the Bachelor of Science degree, is designed to prepare students for a variety of careers by establishing a strong basic science foundation combined with practical experience with agricultural animals at the multiple farm facilities located near campus. ~~Graduates may be employed in marketing, agribusiness, finance, manufacturing, public relations, as extension specialists, as pharmaceutical salespersons, or as advisers on farm management.~~ Graduates often attend veterinary or graduate school.

Insert (1)

Scientific principles of biology and animal science are important components of the program and are combined with opportunities to apply fundamental principles learned in class to farm management. The animal science major also provides students with flexibility. Academic advisers guide students in the development of a planned program of study that is consistent with their interests and goals.

All students in animal science must complete a set of required core courses including breeding and genetics, nutrition, physiology, and management. These principles are taught using horses, dairy cattle, beef cattle, swine, poultry, sheep and companion animals. ~~Students may choose to complete the agribusiness management, preveterinary, production medicine, or science concentration.~~

Insert (2)

~~The agribusiness management concentration is designed to prepare students for careers in managing livestock operations. Marketing, sales, and production of livestock and livestock products offer numerous employment opportunities.~~

~~The preveterinary concentration is designed for students who are interested in careers in veterinary medicine. The requirements for admission to the College of Veterinary Medicine are included in the requirements for this concentration.~~

~~The production medicine scholars concentration is designed to prepare students for a career in herd-based agricultural veterinary practice. Students interested in the professional program in the College of Veterinary Medicine may apply through a special admissions process. Acceptance in the production medicine scholars concentration does not assure acceptance into the College of Veterinary Medicine. See the *College of Veterinary Medicine* section of this catalog for further information about the admissions pathway for production medicine scholars.~~

~~The science concentration is designed to prepare students for graduate study and careers in research and animal product development. This concentration includes additional science courses.~~

Students who are enrolled in the Bachelor of Science degree program with a major in animal science may elect a Specialization in Agricultural and Natural Resources Biotechnology. For additional information, refer to the *Specialization in Agricultural and Natural Resources Biotechnology* statement.

Requirements for the Bachelor of Science Degree in Animal Science

1. The University requirements for bachelor's degrees as described in the *Undergraduate Education* section of this catalog; 120 credits, including general elective credits, are required for the Bachelor of Science degree in Animal Science.
   The University's Tier II writing requirement for the Animal Science major is met by completing all of the following courses: Animal Science 313, 314, 315. Those courses are referenced in item 3. a. below.

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Students who are enrolled in the Animal Science major leading to the Bachelor of Science degree in the Department of Animal Science may complete an alternative track to Integrative Studies in Biological and Physical Sciences that consists of the following courses: Biological Science 111 and 111L, Chemistry 141, and Chemistry 143 or 251. The completion of Biological Science 111L satisfies the laboratory requirement. Biological Science 111 and 111L, Chemistry 141, and Chemistry 143 or 251 may be counted toward both the alternative track and the requirements for the major referenced in item 3. below.

The completion of the College of Agriculture and Natural Resources mathematics requirement may also satisfy the University mathematics requirement.

2. The requirements of the College of Agriculture and Natural Resources for the Bachelor of Science degree.

   Certain courses referenced in requirement 3. below may be counted toward College requirements as appropriate.

3. The following requirements for the major:

		CREDITS
a.	All of the following courses:	~~30~~ 29
	ANS 110 Introductory Animal Agriculture	4
	~~ANS 210 Animal Products~~	~~4~~ 0
	ANS 313 Principles of Animal Feeding and Nutrition	4
	ANS 314 Genetic Improvement of Domestic Animals	4
	ANS 315 Anatomy and Physiology of Farm Animals	4
	ANS 401 Issues in Animal Agriculture	1
	BS 111 Cells and Molecules	3
	BS 111L Cell and Molecular Biology Laboratory	2
	CEM 141 General Chemistry	4
~~b.~~ c.	One of the following courses:	3 or 4
	CEM 143 Survey of Organic Chemistry	4
	CEM 251 Organic Chemistry I	3
	~~A student who selects the Preveterinary concentration is required to complete Chemistry 251 to satisfy requirement 3. b.~~	
~~c.~~ d.	~~Two~~ One of the following species management courses:	~~6~~ 3
	ANS 222 Introductory Beef Cattle Management	3
	ANS 232 Introductory Dairy Cattle Management	3
	ANS 242 Introductory Horse Management	3
	ANS 252 Introduction to Management of Avian Species	3
	ANS 262 Introductory Sheep Management	3
	ANS 272 Introductory Swine Management	3
~~d.~~ e.	One of the following concentrations:	~~24 to 33~~ 23 to 55

Agribusiness Management (24 credits):

(1) The requirements for the Specialization in Agribusiness Management as specified in the *Specialization in Agribusiness Management* statement in the *Department of Agricultural, Food, and Resource Economics* statement (18 credits).

(2) The following course (3 credits):

EC	201	Introduction to Microeconomics	3

(3) One of the following courses (3 credits):

ANS	422	Advanced Beef Cattle Feedlot Management	3
ANS	432	Advanced Dairy Cattle Management	3
ANS	442	Advanced Horse Management	3
ANS	472	Advanced Swine Management	3

Preveterinary (33 credits):

(1) All of the following courses (27 credits):

BMB	401	Basic Biochemistry	4
BS	110	Organisms and Populations	4
CEM	161	Chemistry Laboratory I	1
CEM	252	Organic Chemistry II	3
CEM	255	Organic Chemistry Laboratory	2
MTH	116	College Algebra and Trigonometry	5
PHY	231	Introductory Physics I	3
PHY	232	Introductory Physics II	3
PHY	251	Introductory Physics Laboratory I	1
PHY	252	Introductory Physics Laboratory II	1

(2) At least 6 credits from the following Animal Science courses:

ANS	305	Applied Animal Behavior	3
ANS	320	Muscle Foods	3
ANS	404	Advanced Genetics of Farm Animals	2
ANS	405	Endocrinology of Reproduction	4
ANS	407	Food and Animal Toxicology	3
ANS	413	Monogastric Animal Nutrition	3
ANS	414	Advanced Animal Breeding	2
ANS	415	Growth and Musculoskeletal Biology	3
ANS	416	Meat Science and Muscle Biology	2
ANS	417	Topics in Toxicology	1
ANS	422	Advanced Beef Cattle Feedlot Management	3
ANS	425	Principles of Animal Biotechnology	3
ANS	427	Environmental Toxicology and Society	3
ANS	432	Advanced Dairy Cattle Management	3
ANS	442	Advanced Horse Management	3
ANS	445	Equine Exercise Physiology	4
ANS	455	Avian Physiology	4
ANS	472	Advanced Swine Management	3
ANS	483	Ruminant Nutrition	3

Production Medicine Scholars (29 to 33 credits):

(1) Both of the following courses (9 credits):

ANS	490	Independent Study	6
CSE	101	Computing Concepts and Competencies	3

(2) Two of the following courses (6 credits):

ANS	222	Introductory Beef Cattle Management	3
ANS	232	Introductory Dairy Cattle Management	3
ANS	262	Introductory Sheep Management	3
ANS	272	Introductory Swine Management	3

Courses used to fulfill this requirement may also be used to fulfill requirement 3.c.

ANS 101 Professional Development in Animal Science I 1

ANS 301 Professional Development in Animal Science II 2

Insert (3)

ANS 282 Introductory Companion Animal Management 3

Insert (4)

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(3) Two of the following courses (6 or 7 credits):

ABM	435	Financial Management in the Agri-Food System	3
ABM	437	Agribusiness Strategic Management (W)	3
ANS	413	Monogastric Animal Nutrition	4
ANS	483	Ruminant Nutrition	3

(4) One of the following courses (3 or 4 credits):

ANS	305	Applied Animal Behavior	3
ANS	415	Growth and Musculoskeletal Biology	3
ANS	405	Endocrinology of Reproduction	4
ANS	425	Principles of Animal Biotechnology	3

(5) One of the following courses (3 credits):

ANS	422	Advanced Beef Cattle Feedlot Management	3
ANS	432	Advanced Dairy Cattle Management	3
ANS	472	Advanced Swine Management	3

(6) One of the following courses (2 to 4 credits):

ANS	404	Advanced Genetics of Farm Animals	2
ANS	407	Food and Animal Toxicology	3
ANS	414	Advanced Animal Breeding	2
ANS	416	Meat Science and Muscle Biology	2
ANS	464	Statistics for Biologists	3
STT	201	Statistical Methods	4
ZOL	313	Animal Behavior	3
ZOL	341	Fundamental Genetics	4

Science (24 credits):

(1) The following course (4 credits):

STT	201	Statistical Methods	4

(2) One of the following courses (4 credits):

BMB	200	Introduction to Biochemistry	4
BMB	401	Basic Biochemistry	4

(3) At least 16 credits from the following courses, including at least 6 credits in Animal Science courses:

ANS	305	Applied Animal Behavior	3
ANS	320	Muscle Foods	3
ANS	404	Advanced Genetics of Farm Animals	2
ANS	405	Endocrinology of Reproduction	4
ANS	407	Food and Animal Toxicology	3
ANS	413	Monogastric Animal Nutrition	3
ANS	414	Advanced Animal Breeding	2
ANS	415	Growth and Musculoskeletal Biology	3
ANS	416	Meat Science and Muscle Biology	2
ANS	417	Topics in Toxicology	1
ANS	425	Principles of Animal Biotechnology	3
ANS	427	Environmental Toxicology and Society	3
ANS	445	Equine Exercise Physiology	4
ANS	455	Avian Physiology	4
ANS	483	Ruminant Nutrition	3
BS	110	Organisms and Populations	4
CEM	161	Chemistry Laboratory I	1
CEM	252	Organic Chemistry II	3
CSE	101	Computing Concepts and Competencies	3
CSE	131	Technical Computing and Problem Solving	3
MMG	201	Fundamentals of Microbiology	3
PHY	231	Introductory Physics I	3
PSL	250	Introductory Physiology	4
STT	464	Statistics for Biologists I	3
ZOL	313	Animal Behavior	3
ZOL	341	Fundamental Genetics	4

Students who pass a waiver examination for Computer Science and Engineering 101 may *not* use Computer Science and Engineering 101 to satisfy the requirements for the **Science** concentration.

Insert 1

Graduates may be employed in farm ownership, management, marketing, agribusiness, finance, manufacturing, public relations, extension, or consulting.

Insert 2

Students must choose from one of the following concentrations: animal industry, companion and exotic animal biology, animal biology/preveterinary, or production animal scholars.

The animal industry concentration is designed to prepare students for careers in managing animal operations. Marketing, sales, and production of animals and animal products offer numerous employment opportunities.

The companion and exotic animal biology concentration prepares students for careers in the areas of small animal nutrition, pet food sales, and captive and small animal management. Students may also use their elective credits to complete the preveterinary requirements and apply to the College of Veterinary Medicine.

The animal biology/preveterinary concentration is designed for students who are interested in an advanced degree in animal science or a career in veterinary medicine. The requirements for admission to the College of Veterinary Medicine are included in the requirements for this concentration.

The production animal scholars concentration is a cooperative effort between the Department of Animal Science and the College of Veterinary Medicine. The concentration is for students committed to a career in food animal management and medicine and provides an admissions pathway to Production Medicine Scholars in the College of Veterinary Medicine. Students must (1) declare the concentration when they reach junior standing; (2) submit a formal application for the production animal scholars concentration; (3) have a minimum cumulative grade-point average of 3.00 for admission to the concentration; and (4) demonstrate a commitment to livestock agriculture, excluding horses, through youth activities, family experiences, employment, internships, extracurricular activities, and other participation in the livestock industry.

After completion of the production animal scholars concentration, students will earn a Bachelor of Science degree in Animal Science. Students may then enter veterinary college or pursue a career in farm-based, agricultural veterinary practice. Students completing this concentration must complete the Bachelor of Science degree in Animal Science prior to matriculation into the College of Veterinary Medicine. Students interested in pursuing the admissions pathway to Production Medicine Scholars in the College of Veterinary Medicine should see the *College of Veterinary Medicine* section of this catalog for further information.

Insert 3

b.	One of the following courses:			3 or 4
	STT	200	Statistical Methods	3
	STT	201	Statistical Methods	4
	STT	421	Statistics I	3
	STT	464	Statistics for Biologists	3

Insert 4

Animal Industry (23 to 34 credits)

1. The following course (4 credits):

ANS	210	Animal Products	4

2. One of the following courses (2 or 3 credits):

CSE	101	Computing Concepts and Competencies	3
CSS	110	Computer Applications in Agronomy	2

3. One of the following courses (3 credits):

ABM	100	Decision-making in the Agri-Food System	3
ABM	130	Farm Management I	3

4. One of the following courses (3 credits):

ANS	222	Introductory Beef Cattle Management	3
ANS	232	Introductory Dairy Cattle Management	3
ANS	242	Introductory Horse Management	3
ANS	252	Introduction to Management of Avian Species	3
ANS	262	Introductory Sheep Management	3
ANS	272	Introductory Swine Management	3
ANS	282	Companion Animal Biology and Management	3

The course used to fulfill this requirement may not be used to fulfill requirement 3. d. above.

5. One of the following courses (3 credits):

ANS	422	Advanced Beef Cattle Management	3
ANS	432	Advanced Dairy Cattle Management	3
ANS	442	Advanced Horse Management	3
ANS	472	Advanced Swine Management	3
ANS	482	Advanced Companion Animal Management	3

6. Three of the following courses (6 to 12 credits):

ANS	305	Applied Animal Behavior	3
ANS	309	Health and Hygiene of Livestock	3
ANS	404	Advanced Animal Genetics	2
ANS	405	Endocrinology of Reproduction	4
ANS	406	Animal Welfare: Science and Society	3
ANS	407	Food and Animal Toxicology	3
ANS	413	Monogastric Animal Nutrition	3
ANS	414	Advanced Animal Breeding	2
ANS	415	Growth and Musculoskeletal Biology	3
ANS	416	Meat Science and Muscle Biology	2
ANS	418	Comprehensive Nutrient Management Planning	3
ANS	435	Mammary Physiology	4
ANS	445	Equine Exercise Physiology	4
ANS	455	Avian Physiology	4
ANS	483	Ruminant Nutrition	3

7. One of the following courses (2 to 6 credits):

ANS	493	Professional Internship in Animal Science	3
ANS	300A	Advanced Livestock Judging	2
ANS	300C	Advanced Dairy Cattle Judging	2
ANS	300D	Advanced Horse Judging	2

Six credits in an approved Study Abroad program can be used to fulfill this requirement.

Animal Biology and Preveterinary (39 to 50 credits)

1. All of the following courses (22 credits):

ANS	210	Animal Products	4
ANS	425	Principles of Animal Biotechnology	3
BMB	401	Basic Biochemistry	4
BS	110	Organisms and Populations	4
CEM	161	Chemistry Laboratory I	1
CEM	252	Organic Chemistry II	3
CEM	255	Organic Chemistry Laboratory	2

2. Three of the following courses (7 to 11 credits):

ANS	404	Advanced Animal Genetics	2
ANS	405	Endocrinology of Reproduction	4
ANS	413	Monogastric Animal Nutrition	3
ANS	415	Growth and Musculoskeletal Biology	3
ANS	416	Meat Science and Muscle Biology	2
ANS	435	Mammary Physiology	4
ANS	483	Ruminant Nutrition	3

3. A minimum of 8 credits from the following courses (8 to 12 credits):

ANS	305	Applied Animal Behavior	3
ANS	309	Health and Hygiene of Livestock	3
ANS	406	Animal Welfare: Science and Society	3
ANS	407	Food and Animal Toxicology	3
ANS	414	Advanced Animal Breeding	2
ANS	418	Comprehensive Nutrient Management Planning	3
ANS	445	Equine Exercise Physiology	4
ANS	455	Avian Physiology	4
MMG	301	Introductory Microbiology	3
MMG	302	Introductory Laboratory for General and Allied Health Microbiology	1
MMG	409	Eucaryotic Cell Biology	3
PHM	450	Introduction to Chemical Toxicity	3
PHY	231	Introductory Physics I	3
PHY	232	Introductory Physics II	3
PHY	251	Introductory Physics Laboratory I	1
PHY	252	Introductory Physics Laboratory II	1
ZOL	313	Animal Behavior	3
ZOL	341	Fundamental Genetics	4

4. One of the following courses (3 to 6 credits):

ANS	492	Undergraduate Research in Animal Science	3
ANS	493	Professional Internship in Animal Science	3

Six credits in an approved Study Abroad program can be used to fulfill this requirement.

Companion and Exotic Animal Biology (43 to 52 credits)

1. All of the following courses (19 credits):

ANS	282	Companion Animal Biology and Management	3
ANS	482	Advanced Companion Animal Management	3
BS	110	Organisms and Populations	4
CEM	252	Organic Chemistry II	3
CEM	255	Organic Chemistry Laboratory	2
ZOL	328	Comparative Anatomy and Biology of Vertebrates (W)	4

2. One of the following courses (4 credits):

BMB	200	Introduction to Biochemistry	4
BMB	401	Basic Biochemistry	4

3. Two of the following courses (6 to 8 credits):

ANS	305	Applied Animal Behavior	3
ANS	405	Endocrinology of Reproduction	4
ANS	413	Monogastric Animal Nutrition	3
ANS	435	Mammary Physiology	4
ANS	483	Ruminant Nutrition	3

4. Four of the following courses (11 to 15 credits):

ANS	404	Advanced Genetics	2
ANS	406	Animal Welfare: Science and Society	3
ANS	407	Food and Animal Toxicology	3
ANS	415	Growth and Musculoskeletal Biology	3
ANS	418	Comprehensive Nutrient Management Planning	3
ANS	425	Principles of Animal Biotechnology	3
ANS	445	Equine Exercise Physiology	4
ANS	455	Avian Physiology	4
ZOL	313	Animal Behavior	3
ZOL	341	Fundamental Genetics	4
ZOL	355	Ecology	3
ZOL	369	Introduction to Zoo and Aquarium Science	3

5. One of the following courses (3 to 6 credits):

ANS	492	Undergraduate Research in Animal Science	3
ANS	493	Professional Internship in Animal Science	3

Six credits in an approved Study Abroad program can be used to fulfill this requirement.

Production Animal Scholars (52 to 55 credits):

1. All of the following courses (33 credits):

ANS	210	Animal Products	4
BMB	401	Basic Biochemistry	4
BS	110	Organisms and Populations	4
CEM	161	Chemistry Laboratory I	1
CEM	252	Organic Chemistry II	3
CEM	255	Organic Chemistry Laboratory	2
MMG	301	Introductory Microbiology	3
MMG	302	Introductory Laboratory for General and Allied Health Microbiology	1
MMG	409	Eucaryotic Cell Biology	3
PHY	231	Introductory Physics I	3
PHY	232	Introductory Physics II	3
PHY	251	Introductory Physics Laboratory I	1
PHY	252	Introductory Physics Laboratory II	1

2. One of the following courses (3 credits):

ANS	222	Introductory Beef Cattle Management	3
ANS	232	Introductory Dairy Cattle Management	3
ANS	252	Introduction to Management of Avian Species	3
ANS	262	Introductory Sheep Management	3
ANS	272	Introductory Swine Management	3

The course used to fulfill this requirement may not be used to fulfill requirement 3. d. above.

3. Two of the following courses (6 credits):

ABM	435	Financial Management in the Agri-Food System	3
ABM	437	Agribusiness Strategic Management (W)	3
ANS	413	Monogastric Animal Nutrition	3
ANS	483	Ruminant Nutrition	3

4.	One of the following courses (3 to 4 credits):			
	ANS	305	Applied Animal Behavior	3
	ANS	405	Endocrinology of Reproduction	4
	ANS	415	Growth and Musculoskeletal Biology	3
	ANS	425	Principles of Animal Biotechnology	3
	ANS	435	Mammary Physiology	4
5.	One of the following courses (3 credits):			
	ANS	422	Advanced Beef Cattle Management	3
	ANS	432	Advanced Dairy Cattle Management	3
	ANS	472	Advanced Swine Management	3
6.	One of the following courses (2 to 4 credits):			
	ANS	404	Advanced Animal Genetics	2
	ANS	407	Food and Animal Toxicology	3
	ANS	414	Advanced Animal Breeding	2
	ANS	416	Meat Science and Muscle Biology	2
	ANS	418	Comprehensive Nutrient Management Planning	3
	ANS	455	Avian Physiology	4
	ZOL	313	Animal Behavior	3
	ZOL	341	Fundamental Genetics	4
7.	The following course (2 credits):			
	ANS	390	Animal Science Practicum	2