

# Department of Animal, Dairy and Veterinary Sciences

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**Degrees offered:** Bachelor of Science (BS) in Animal, Dairy and Veterinary Sciences; Master of Science (MS) in Animal Science, Bioveterinary Science, Dairy Science; Doctor of Philosophy (PhD) in Animal Science and Bioveterinary Science; MS and PhD degrees in Toxicology are available through the Interdepartmental Toxicology program

**Undergraduate Emphases:** Animal and Dairy Science, Biotechnology, Bioveterinary Science, and Equine Science and Management

**Graduate Specializations:** *Animal/Dairy Science*—Animal Nutrition, Breeding and Genetics, Molecular Biology, Reproductive Biology, Animal or Dairy Management (MS only)

**Certificate Program:** Dairy Herdsman

## Undergraduate Programs

### Objectives

Bachelor's degree students majoring in Animal, Dairy and Veterinary Sciences may choose a program from four career emphasis areas: **Animal and Dairy Science, Biotechnology, Bioveterinary Science, and Equine Science and Management.**

The curricula in the **Animal and Dairy Science Emphasis** is designed to prepare students for a variety of rewarding careers in the dynamic disciplines of animal and dairy agriculture. Teaching and research facilities, as well as the USU livestock herds and flocks, are available for hands-on practical laboratory experiences, along with faculty-mentored research projects. Graduates from this emphasis may seek careers in animal or dairy production and management; in state or federal government agricultural agencies; and in fields that support or interact with animal agriculture, such as corporate agribusiness, wholesale and retail marketing and sales, commodity trading, animal product processing, agricultural cooperatives, and producer/commodity associations. This emphasis may also prepare students for advanced degrees in areas such as animal research in genetics, reproductive biology, nutrition, and management. An especially close student-advisor relationship is required to help students develop, schedule, and accelerate their personal undergraduate degree program and is essential for professional success in these areas.

The **Biotechnology Emphasis** is designed to prepare students who earn a bachelor's degree for careers in the expanding biotechnology

industry or for graduate study in related fields. Nationwide there are more than 1,200 biotechnology/biopharmaceutical companies with additional start-ups developing every year. Increases in federal funding for research in animal biotechnology, along with heightened private sector activity, have led to unprecedented career prospects in molecular biology, genomics, bioinformatics, developmental biology, and associated areas. USU has made a major commitment to biotechnology since 1986. The ADVS Department is heavily involved in biotechnology research and teaching, and the resources of the Center for Integrated BioSystems are also available to support this emphasis.

The ADVS Department offers a strong program in preveterinary study leading to the BS degree in the **Bioveterinary Science Emphasis**. This is not a college of veterinary medicine, but a preveterinary program. The degree is a nonterminal program designed primarily for those students who intend to apply to veterinary school. This program consists of three to four years of study, after which the student is eligible to apply to several veterinary schools. The preveterinary program can be individually tailored to maximize a student's chances of gaining acceptance into a school of veterinary medicine. If a student is uncertain of his or her interests and aptitudes for veterinary medicine, the program is an excellent opportunity to gain experience and make career choices. The student who wants to test his or her potential in a veterinary career should first enroll in the preveterinary program and then later can simultaneously develop a major in another field. Students should consult with the ADVS academic advisor and the preveterinary program coordinator to develop a program of study which best meets their needs and requirements.

There are many exciting career paths in the equine industry, and the ADVS Department has the resources and courses to prepare students to determine their path. The **Equine Science and Management Emphasis** provides an education that will place students among the most sought-after graduates in the equine industry. The program offers courses, internships, volunteer activities, and clubs that prepare students specifically for careers in various aspects of the equine industry. Students will be able to obtain hands-on experiences in the classroom, arena, and stabling facilities. Opportunities will be available in horsemanship, training, managing horses of all ages, stallion handling and breeding, and mare and foal care.

Instruction in the ADVS Department also encompasses a diversified co-curricular program including allied clubs, intercollegiate livestock judging and rodeo teams, and involvement with their respective professional societies.

### Preveterinary Program

Preveterinary students take courses required by veterinary schools. Classes should be planned to assure meeting the current requirements for the veterinary schools to which the student plans to apply for admission. In most cases, preveterinary preparation requires a major portion of three academic years. Students accepted into veterinary school prior to completion of their BS degree may transfer credits back to USU for completion of their BS degree in Bioveterinary Science.

Utah participates in WICHE (Western Interstate Commission for Higher Education) which provides state subsidization of Utah resident (5 years or longer at the time of application) students entering any veterinary school that is a WICHE-participating school. At present this includes Colorado State University, Washington State University, and Oregon State University. The State of Utah also provides some support for a limited number of resident students who enroll at non-WICHE veterinary schools in the continental United States. Students may also apply to other veterinary schools as out-of-state applicants.

# Department of Animal, Dairy and Veterinary Sciences

## Vocational Subbaccalaureate Program

### Dairy Herdsman Certificate

Students completing the required courses and experience in the Dairy Herdsman's curriculum usually find employment with a commercial or family dairy. Some enter dairy-related businesses. Students desiring to continue their dairy education may complete a BS degree in three additional years with proper planning and suitable academic performance.

## Requirements

### Departmental Admission Requirements

Undergraduate admission requirements for the Animal and Dairy Science, Biotechnology, and Equine Science and Management emphases are the same as those described for the University. Students in good standing may apply for admission to the department. New freshmen admitted to USU in good standing qualify for admission to the Bioveterinary Science emphasis. Students with less than 60 semester credits transferring from other institutions need a 2.2 transfer GPA, and students with less than 60 semester credits transferring from other USU majors need a 2.0 GPA for admission to the Bioveterinary Science emphasis. All students with 60 or more semester credits need a 2.75 total GPA to be admitted to advanced standing in Bioveterinary Science.

### Departmental Standards

The following minimum requirements apply to all students working toward a bachelor's degree in Animal, Dairy and Veterinary Sciences. Bachelor's degree candidates must comply with these requirements in order to graduate: (1) courses required for the major may be repeated only once to improve a grade, and (2) courses required for the major may not be taken for pass-fail credit. In addition to these requirements, candidates must attain a grade point average of at least 2.50 in the ADVS courses specified as requirements in their emphasis curricula to graduate. Animal and Dairy Science, Biotechnology, and Equine Science and Management emphases candidates must attain an overall GPA of at least 2.25 to graduate. Bioveterinary Science emphasis candidates must attain an overall GPA of at least 3.0 to graduate.

## Academic Advising

Successful completion of a bachelor's degree program in the ADVS Department requires that a very close student-academic advisor relationship be established and continued through each student's bachelor's degree program. Each student must take the responsibility of establishing this close working relationship with his or her advisor. Doing this soon after a student's acceptance into the department can keep academic problems to a minimum.

## Graduation Requirements

Courses required and recommended for meeting BS degree graduation requirements in the various emphases available in the department are as follows.

## Animal and Dairy Science Emphasis

### Freshman Year

#### Fall Semester

ADVS 1110 Introduction to Animal Science.....	4
ADVS 1910 Orientation to Animal and Dairy Science.....	0.5
ADVS 2120 <sup>1</sup> Swine Production Practices (2 cr) <b>or</b>	
ADVS 2130 <sup>1</sup> Dairy Production Practices (3 cr) <b>or</b>	
ADVS 2190 <sup>1</sup> Horse Production Practices (2 cr) .....	2 or 3
MATH 1050 (QL) College Algebra.....	4
University Studies Breadth Course.....	3

#### Spring Semester

ADVS 2200 Anatomy and Physiology of Animals.....	4
ENGL 1010 (CL1) Introduction to Writing: Academic Prose .....	3
ADVS 2080 <sup>1</sup> Beef Production Practices (2 cr) <b>or</b>	
ADVS 2090 <sup>1</sup> Sheep Production Practices (2 cr).....	2
STAT 1040 (QL) Introduction to Statistics (3 cr) <b>or</b>	
STAT 2000 (QI) Statistical Methods (3 cr).....	3
University Studies Breadth Course.....	3

### Sophomore Year

#### Fall Semester

CHEM 1210 Principles of Chemistry I.....	4
CHEM 1215 Chemical Principles Laboratory I .....	1
Two University Studies Breadth Courses .....	6
Directed Elective Course .....	3

#### Spring Semester

CHEM 1220 (BPS) Principles of Chemistry II .....	4
CHEM 1225 Chemical Principles Laboratory II .....	1
ADVS 3000 Animal Health and Hygiene .....	3
ENGL 2010 (CL2) Intermediate Writing: Research Writing in a Persuasive Mode .....	3
Directed Elective Course .....	3

### Junior Year

#### Fall Semester

BIOL 1610 Biology I .....	4
ADVS 3500 Principles of Animal Nutrition .....	3
ADVS 4910 Preprofessional Orientation .....	0.5
Two Directed Elective Courses.....	6
University Studies Depth Course.....	3

#### Spring Semester

BIOL 1620 (BLS) Biology II.....	4
ADVS 3510 (QI) Applied Animal Nutrition .....	3
ADVS 4200 (CI) Physiology of Reproduction and Lactation .....	4
Directed Elective Course .....	3

### Senior Year

#### Fall Semester

ADVS 4560 (QI) Principles of Animal Breeding.....	3
ADVS 4920 (CI) Undergraduate Seminar .....	2
ADVS 5120 <sup>2</sup> Swine Management.....	3
ADVS 4250 Internship in Animal Industry (3 cr) <b>or</b>	
ADVS 4800 Undergraduate Research or Creative Opportunity (3 cr) .....	3
Directed Elective Course .....	3

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## Spring Semester

<b>ADVS 5080<sup>2</sup></b> Beef Management (3 cr) <b>or</b>	
<b>ADVS 5090<sup>2</sup></b> Sheep Management and Wool Technology (4 cr) <b>or</b>	
<b>ADVS 5130<sup>2</sup></b> Dairy Cattle Management (3 cr) <b>or</b>	
<b>ADVS 5190<sup>2</sup></b> Horse Management (3 cr) .....	3-4
Two Directed Elective Courses.....	6
University Studies Depth Course.....	3

## Directed Electives

Students must choose eight courses from the following:

<b>ACCT 2010<sup>3</sup></b> Survey of Accounting I (F,Sp,Su) .....	3
<b>ADVS 3650</b> Live Animal and Carcass Evaluation (F).....	3
<b>ADVS 5030</b> Sustainable Agricultural Production Systems with Animals (F).....	3
<b>ADVS 5530</b> Nutritional Management of Farm Animals (Sp).....	3
<b>ADVS 5860</b> Poisonous Range Plants Affecting Livestock (Sp).....	3
One additional management course (ADVS 5080, 5090, 5120, 5130, or 5190) .....	3-4
<b>APEC/ECN 2010 (BSS)</b> Introduction to Microeconomics (F,Sp,Su) .....	3
<b>APEC 3010<sup>3</sup></b> Introduction to Agricultural Economics and Agribusiness (Sp) .....	3
<b>APEC 3020<sup>3</sup></b> Firm Finance and Records Analysis (Sp).....	3
<b>APEC 5010 (QI)</b> Firm Marketing and Price Analysis (F) .....	3
<b>BIOL 3060 (QI)</b> Principles of Genetics (F,Sp,Su) .....	4
<b>BIOL 3300</b> General Microbiology (F,Sp) .....	4
<b>BUS 3400 (QI)</b> Finance Fundamentals .....	3
<b>BUS 3500</b> Marketing Principles.....	3
<b>BUS 3700</b> Operations Management Fundamentals.....	3
<b>CHEM 2310<sup>4</sup></b> Organic Chemistry I (F) .....	4
<b>CHEM 2315<sup>4</sup></b> Organic Chemistry Laboratory I (F) .....	1
<b>CHEM 2320<sup>4</sup></b> Organic Chemistry II (Sp) .....	4
<b>CHEM 3700<sup>4</sup></b> Introductory Biochemistry (Sp) .....	3
<b>ECN 3010 (DSS)</b> Managerial Economics (F,Sp) .....	3
<b>MATH 1100 (QL)</b> Calculus Techniques (F,Sp,Su) (3 cr) <b>or</b>	
<b>MATH 1210 (QL)</b> Calculus I (F,Sp,Su) (4 cr) .....	3-4
<b>MGT 2050</b> Legal and Ethical Environment of Business (F,Sp,Su) .....	3
<b>MGT 3110 (DSS)</b> Managing Organizations and People (F,Sp,Su).....	3
<b>NFS 4900</b> Special Problems: Dairy Processing .....	4
<b>NFS 5020</b> Meat Technology and Processing (F).....	4
<b>PLSC 4320</b> Forage Production and Pasture Ecology (F).....	3
<b>SOIL 2000 (BPS)</b> Soils, Waters, and the Environment (Sp) (3 cr) <b>or</b>	
<b>SOIL 3000</b> Fundamentals of Soil Science (F,Sp) (4 cr) .....	3-4
<b>WILD 2200 (BLS)</b> Ecology of our Changing World (F,Sp) .....	3
<b>WILD 3600</b> Wildland Plant Ecology and Identification (F).....	4
<b>WILD 4000</b> Principles of Rangeland Management (Sp).....	3
<b>WILD 4850</b> Vegetation and Habitat Management (F) .....	3

<sup>1</sup>Students must take two courses selected from: ADVS 2080, 2090, 2120, 2130, and 2190.

<sup>2</sup>Students must take one course selected from: ADVS 5080, 5090, 5120, 5130, and 5190.

<sup>3</sup>Students may obtain an Agribusiness Management Minor by taking APEC 3010, 3020; ECN 1500 (BAI); and ACCT 2010.

<sup>4</sup>Students may obtain a Chemistry Minor by taking CHEM 2310, 2315, 2320, and 3700.

## Biotechnology Emphasis

### Freshman Year

#### Fall Semester

<b>ADVS 1110</b> Introduction to Animal Science.....	4
<b>CHEM 1210</b> Principles of Chemistry I .....	4
<b>CHEM 1215</b> Chemical Principles Laboratory I .....	1
<b>MATH 1050 (QL)</b> College Algebra.....	4
<b>ENGL 1010 (CL1)</b> Introduction to Writing: Academic Prose .....	3

### Spring Semester

<b>ADVS 2040</b> Introduction to Biotechnology .....	1
<b>ADVS 2200</b> Anatomy and Physiology of Animals.....	4
<b>CHEM 1220 (BPS)</b> Principles of Chemistry II .....	4
<b>CHEM 1225</b> Chemical Principles Laboratory II .....	1
<b>STAT 2000 (QI)</b> Statistical Methods .....	3
University Studies Breadth Course.....	3

### Sophomore Year

#### Fall Semester

<b>BIOL 1610</b> Biology I .....	4
<b>CHEM 2310</b> Organic Chemistry I .....	4
<b>CHEM 2315</b> Organic Chemistry Laboratory I .....	1
Two University Studies Breadth Courses .....	6

#### Spring Semester

<b>BIOL 1620 (BLS)</b> Biology II.....	4
<b>CHEM 2320</b> Organic Chemistry II .....	4
<b>ADVS 3000</b> Animal Health and Hygiene .....	3
<b>ENGL 2010 (CL2)</b> Intermediate Writing: Research Writing in a Persuasive Mode .....	3
University Studies Breadth Course.....	3

### Junior and Senior Years

#### Required Classes

<b>ADVS 3020</b> Biotechnology in Agriculture (F).....	3
<b>ADVS 3200</b> Ethical Issues in Genetic Engineering and Biotechnology (Sp) .....	3
<b>ADVS 4260</b> Internship in Animal Biotechnology Industry (F,Sp,Su) (2-12 cr) <b>or</b>	
<b>ADVS 4800</b> Undergraduate Research or Creative Opportunity (F,Sp,Su) (1-6 cr) .....	3-12
<b>ADVS 4910</b> Preprofessional Orientation (F) .....	0.5
<b>ADVS 4920 (CI)</b> Undergraduate Seminar (F).....	2
<b>ADVS 5160</b> Methods in Biotechnology: Cell Culture (Sp).....	3
<b>ADVS 5260</b> Methods in Biotechnology: Molecular Cloning (F).....	3
<b>ADVS 5280</b> Animal Molecular Biology (Sp).....	3
<b>BIOL 3060 (QI)</b> Principles of Genetics (F,Sp,Su) .....	4
<b>BIOL 3300</b> General Microbiology (F,Sp) .....	4
<b>CHEM 3700</b> Introductory Biochemistry (Sp).....	3
Two University Studies Depth Courses .....	6

#### Directed Electives

Students must select at least 18 credits from the following. At least one course with a Communications Intensive (CI) designation must be included.

<b>ADVS 3500</b> Principles of Animal Nutrition (F) .....	3
<b>ADVS 3510 (QI)</b> Applied Animal Nutrition (Sp).....	3
<b>ADVS 4200 (CI)</b> Physiology of Reproduction and Lactation (Sp) .....	4
<b>ADVS 4560 (QI)</b> Principles of Animal Breeding (F).....	3
<b>ADVS 5690</b> Animal Histology (F) .....	3
<b>ADVS 5700 (CI)</b> General Animal Pathobiology (Sp) .....	3
<b>ADVS 5820</b> Animal Cytogenetics and Gene Mapping (F).....	3
<b>BIOL 5150</b> Immunology (Sp).....	3
<b>BIOL 5210</b> Cell Biology (F) .....	3
<b>BIOL 5230</b> Developmental Biology (Sp) .....	3
<b>MATH 1100 (QL)</b> Calculus Techniques (F,Sp,Su) .....	3
<b>PHYS 2110</b> The Physics of Living Systems I .....	4
<b>PHYS 2120 (BPS)</b> The Physics of Living Systems II .....	4

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## Bioveterinary Science Emphasis Curriculum (3.0 minimum total GPA required)

This is a four-year program, preparing students for application and admittance to veterinary school or graduate school. In recent years, **nearly all students who have been accepted to veterinary school have had at least a 3.4 GPA.**

### Advanced Standing Requirements

To attain Advanced Standing in Bioveterinary Science, students must have completed or must be currently registered for a minimum of 60 semester credits, and must have earned an overall GPA of at least 2.75 for all credits, including transfer credits, taken up to the time the petition for Advanced Standing is made.

Students' records will be checked when they reach a total of 60 semester credits. Those who do not meet advanced standing requirements will be notified to meet with their advisor.

### Freshman Year

#### Fall Semester

ADVS 1110 Introduction to Animal Science.....	4
ADVS 1920 Orientation to Bioveterinary Science .....	1
CHEM 1210 Principles of Chemistry I .....	4
CHEM 1215 Chemical Principles Laboratory I .....	1
MATH 1100 (QL) Calculus Techniques .....	3
University Studies Breadth Course.....	3

#### Spring Semester

ADVS 2200 Anatomy and Physiology of Animals.....	4
CHEM 1220 (BPS) Principles of Chemistry II .....	4
CHEM 1225 Chemical Principles Laboratory II .....	1
ENGL 1010 (CL1) Introduction to Writing: Academic Prose .....	3
STAT 2000 (QI) Statistical Methods .....	3

#### Summer Semester

ADVS 3920, Internship in Veterinary Medicine, is a recommended option. Students may count up to 2 credits of ADVS 3920 as elective upper-division credits toward graduation.

### Sophomore Year

#### Fall Semester

BIOL 1610 Biology I .....	4
CHEM 2310 Organic Chemistry I .....	4
CHEM 2315 Organic Chemistry Laboratory I .....	1
Two University Studies Breadth Courses .....	6

#### Spring Semester

BIOL 1620 (BLS) Biology II.....	4
CHEM 2320 Organic Chemistry II .....	4
BIOL 3060 (QI) Principles of Genetics .....	4
University Studies Breadth Course.....	3

### Junior Year

#### Fall Semester

ADVS 3500 Principles of Animal Nutrition.....	3
ADVS 4930 Undergraduate Seminar in Veterinary Medicine.....	2
BIOL 3300 General Microbiology .....	4
PHYS 2110 The Physics of Living Systems I .....	4
ENGL 2010 (CL2) Intermediate Writing: Research Writing in a Persuasive Mode.....	3

#### Spring Semester

ADVS 3000 Animal Health and Hygiene .....	3
PHYS 2120 (BPS) The Physics of Living Systems II .....	4
CHEM 3700 Introductory Biochemistry .....	3
Two Upper-division University Studies Depth and Communications Intensive (CI) Courses.....	6

### Senior Year

Students must complete at least 120 semester credits for the BS degree, of which at least 40 credits must be in upper-division courses. The student must complete two courses which are designated Communications Intensive (CI), and one course which is designated Quantitative Intensive (QI). Students must include at least 15 credits from the following list. An additional 10 elective credits are needed to complete the 120 credits required for graduation. Other upper-division life sciences courses may be applied to this requirement, if approved by the ADVS academic advisor.

ADVS 3510 (QI) Applied Animal Nutrition (Sp).....	3
ADVS 4200 (CI) Physiology of Reproduction and Lactation (Sp) .....	4
ADVS 4560 (QI) Principles of Animal Breeding (F).....	3
ADVS 5690 Animal Histology (F) .....	3
ADVS 5700 (CI) General Animal Pathobiology (Sp) .....	3
BIOL 5150 Immunology (Sp).....	3
BIOL 5210 Cell Biology (F) .....	3
BIOL 5230 Developmental Biology (Sp) .....	3
BIOL 5330 Virology (Sp) .....	3

## Equine Science and Management Emphasis

### Freshman Year

#### Fall Semester

ADVS 1110 Introduction to Animal Science.....	4
ADVS 1910 Orientation to Animal and Dairy Science .....	0.5
ADVS 2190 Horse Production Practices .....	2
ENGL 1010 (CL1) Introduction to Writing: Academic Prose .....	3
MATH 1050 (QL) College Algebra.....	4
University Studies Breadth Course.....	3

#### Spring Semester

ADVS 1600 Riding Fundamentals I.....	2
ADVS 2200 Anatomy and Physiology of Animals.....	4
STAT 1040 (QL) Introduction to Statistics .....	3
Two University Studies Breadth Courses .....	6

### Sophomore Year

#### Fall Semester

ADVS 2300 Stable Management I .....	3
ADVS 2650 <sup>5</sup> Riding Fundamentals II—Hunter .....	2
BIOL 1010 (BLS) <sup>6</sup> Biology and the Citizen .....	3
CHEM 1110 (BPS) <sup>7</sup> General Chemistry I .....	4
University Studies Breadth Course.....	3

#### Spring Semester

ADVS 2310 Stable Management II .....	3
ADVS 2600 <sup>6</sup> Riding Fundamentals II—Western .....	2
CHEM 1120 (BPS) <sup>7</sup> General Chemistry II .....	4
ADVS 3000 Animal Health and Hygiene .....	3
Directed Elective Course .....	3

### Junior Year

#### Fall Semester

ADVS 3100 Equine Evaluation I.....	2
ADVS 3500 Principles of Animal Nutrition .....	3
ADVS 3600 Equine Behavior and Training I .....	2
ADVS 4910 Preprofessional Orientation .....	0.5
Three Directed Elective Courses.....	9

#### Spring Semester

ADVS 3520 Equine Nutrition .....	1
ENGL 2010 (CL2) Intermediate Writing: Research Writing in a Persuasive Mode.....	3
Two Directed Elective Courses.....	6
Depth Course .....	3

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## Senior Year

### Fall Semester

ADVS 4270 Internship in Equine Industry .....	3
ADVS 4300 Stable Management III .....	3
ADVS 4560 (QI) Principles of Animal Breeding.....	3
ADVS 4920 (CI) Undergraduate Seminar .....	2
Directed Elective Course .....	3
Depth Course .....	3

### Spring Semester

ADVS 4200 (CI) Physiology of Reproduction and Lactation .....	4
ADVS 4310 Stable Management IV .....	3
ADVS 5190 Horse Management.....	3
Two Directed Elective Courses.....	6

### Directed Electives

Students must choose five courses from the following list:

ADVS 3150 Equine Evaluation II (Sp).....	2
ADVS 3690 Equine Behavior and Training II (Sp).....	2
ADVS 3910 ST: Horseshoeing .....	3
ADVS 5030 Sustainable Agricultural Production Systems with Animals (F) .....	3
ADVS 5530 Nutritional Management of Farm Animals (Sp).....	3
ADVS 5860 Poisonous Range Plants Affecting Livestock (Sp) .....	3
PLSC 4320 Forage Production and Pasture Ecology (F).....	3
SOIL 2000 (BPS) Soils, Waters, and the Environment (Sp) .....	3
WILD 4000 Principles of Rangeland Management (Sp) .....	3

Students must choose four courses from the following list:

ACCT 2010 <sup>8</sup> Survey of Accounting I (F,Sp,Su) .....	3
APEC/ECN 2010 (BSS) Introduction to Microeconomics (F,Sp,Su) .....	3
APEC 3010 <sup>8</sup> Introduction to Agricultural Economics and Agribusiness (Sp) .....	3
APEC 3020 <sup>8</sup> Firm Finance and Records Analysis (Sp).....	3
APEC 5010 (QI) Firm Marketing and Price Analysis (F) .....	3
BUS 3400 (QI) Finance Fundamentals .....	3
BUS 3500 Marketing Principles.....	3
BUS 3700 Operations Management Fundamentals.....	3
ECN 3010 (DSS) Managerial Economics (F,Sp) .....	3
MGT 2050 Legal and Ethical Environment of Business (F,Sp,Su) .....	3
MGT 3110 (DSS) Managing Organizations and People (F,Sp,Su).....	3

<sup>8</sup>Students must choose one course from the following: ADVS 2600 or 2650.

<sup>9</sup>Students may take BIOL 1610 and 1620 if they desire to pursue a postbaccalaureate degree.

<sup>7</sup>Students may take CHEM 1210, 1215, 1220, and 1225 if they desire to pursue a postbaccalaureate degree.

<sup>8</sup>Students may obtain an Agribusiness Management Minor by taking APEC 3010, 3020; ECN 1500 (BAI); and ACCT 2010.

## Dairy Herdsman Program

### The Program

The Dairy Herdsman Program is a one-year course of study in practical dairy knowledge and skills. Through lectures, laboratory exercises, and actual on-the-farm experiences, students are taught to be dairy herdsman, with highly employable skills. A high school education is highly recommended, but is not a requirement to be admitted to the program.

The classroom and laboratory experiences are directed by Utah State University staff members, extension personnel, and specially qualified guest speakers. Coursework covers such areas as nutrition and feeding, management, physiology, milk production, breeding and selection, and buildings and equipment. Students also gain practical experience and know-how by working with a commercial dairyman in Cache Valley. Many students are now selecting the new degree option, which allows students to take the dairy herdsman classwork and then continue on for a degree in dairy science.

All students may participate in judging at regional and national levels, showing at state and area shows, working with area sales, and field trips to the Western International Dairy Expo, the Dairy Herd Improvement Laboratory, and progressive dairy enterprises. These activities provide a well-rounded background and improve employment opportunities.

Students in this program have access to all privileges available to Utah State University students: athletic and entertainment events, campus housing and food services, the University library, the bookstore, and recreational facilities.

### Career Opportunities

Students who complete this program will have a good working knowledge of how to care for and make decisions about various dairy animals and will understand and be able to use various types of equipment. These skills, as well as an understanding of the management process involved, can greatly improve the chances of being employed by a dairy or dairy-related industry.

### Required Coursework for Dairy Herdsman Program

#### Fall Semester (16 credits)

ADVS 1010 Artificial Insemination and Reproduction .....	2
ADVS 1020 Dairy Cattle Nutrition and Feeding .....	3
ADVS 1050 Dairy Genetics .....	3
ADVS 1250 Applied Agricultural Computations.....	2
ADVS 2130 Dairy Production Practices .....	3
ADVS 2250 Cooperative Work Experience.....	3

#### Spring Semester (16 credits)

ADVS 1030 Lactation and Milking Systems .....	3
ADVS 1040 Records and Financial Aspects of Dairy Herd Operations .....	3
ADVS 1060 Applied Feeding and Management of Dairy Calves and Basic Construction of Facilities .....	3
ADVS 1720 Dairy Cattle Evaluation and Judging .....	1
ADVS 2250 Cooperative Work Experience.....	6

### Honors

There is also an Honors Plan for students desiring a BS degree "with Honors" in Animal, Dairy and Veterinary Sciences. For details, students should contact their academic advisor.

### ADVS Minors

A minor can be valuable when associated with a major in agricultural education, agricultural economics, plant science, nutrition and food science, business, economics, computer science, rangeland resources, and in other disciplines where the animal industry has direct or indirect involvement.

Requirements for specialty or emphasis area minors are listed below. The same departmental standards applying to the Animal, Dairy and Veterinary Sciences major also apply to all minors (see page 157).

### Requirements for Minors

The following is a listing of courses for the various minor emphasis areas. A specific course may not be used to fulfill the requirements of more than one ADVS minor.

#### Animal and Dairy Science

ADVS 1110; choose one or more courses from ADVS 2080, 2090, 2120, 2130, and 2190; 10 elective ADVS credits with approval of the ADVS academic advisor.

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## **Bioveterinary Science**

ADVS 2200, 3000; 7 elective ADVS credits with approval of the ADVS academic advisor. A minimum grade of C is required in all courses applied toward this minor.

## **Equine**

ADVS 1110, 1600, 2190, 2300, 3100, 3600; ADVS 2600 or 2650; one other ADVS course with approval of the ADVS academic advisor.

## **Dairy Herdsman**

ADVS 1020, 1030, 1040, 1050, 1060.

Transfer students must have a minimum of one 3-credit upper-division course in residency with the approval of the ADVS academic advisor.

## **Undergraduate Program Assessment**

The ADVS Department assessment plan defines learning objectives for each of its undergraduate emphases. These learning objectives are mapped to each of the required courses in each emphasis, so that they may be evaluated for their contribution to emphasis goals. Outcome measures have also been defined for each emphasis, and a process has been implemented to conduct exit interviews with all graduating students in Animal, Dairy and Veterinary Sciences. Rate of admission to a professional veterinary medical program has been identified as the critical outcome measure for the Bioveterinary Science emphasis. The ADVS Department Curriculum Committee oversees the assessment process, with input from the ADVS Department Internship and Placement Committee. The ADVS Curriculum Committee reports its assessment findings to the ADVS department head, as well as to faculty members, and incorporates these findings in its regular ongoing and periodic comprehensive reviews and revisions of the ADVS Department undergraduate emphases.

## **Learning Objectives**

### **Animal and Dairy Science Emphasis**

The following *Disciplinary Knowledge* objectives apply:

1. Attain knowledge in mathematics and basic sciences required for disciplinary competency.
2. Know the nature, intent, and scope of animal and dairy science.
3. Attain depth in two subfields of animal and dairy science.
4. Achieve understanding in the disciplines of animal genetics, health, nutrition, and reproduction.
5. Integrate knowledge from the various disciplines to effectively conduct livestock operations.

*Skills and Career Competencies* objectives are as follows:

1. Comprehend reading materials appropriate to course levels.
2. Communicate effectively in oral and written forms.
3. Conduct library research using modern methods.
4. Use a computer for written work, presentations, and research.
5. Attain proficiency in basic techniques of animal management.

### **Biotechnology Emphasis**

The following *Disciplinary Knowledge* objectives apply:

1. Attain a working knowledge of biological mechanisms, including genetics, reproduction, and microbiology.
2. Acquire a working knowledge of mathematics, including calculus and statistics.
3. Achieve a working knowledge of chemistry, including inorganic, organic, and biochemistry.
4. Attain a basic knowledge of animal biotechnology and ethics.

*Skills and Career Competencies* objectives are as follows:

1. Understand and perform molecular cloning.
2. Understand and perform cell culture procedures.
3. Understand and perform protein purification.
4. Communicate effectively in oral and written forms.
5. Achieve quantitative competency.
6. Conduct scientific-literature searches using modern methods.

### **Bioveterinary Science Emphasis**

The following *Disciplinary Knowledge* objectives apply:

1. Attain a working knowledge of biological mechanisms, including molecular genetics.
2. Acquire a working knowledge of mathematics, including calculus and statistics.
3. Achieve a working knowledge of chemistry, including inorganic, organic, and biochemistry.
4. Acquire a basic knowledge of general physics.
5. Attain a basic knowledge of animal production, including breeding, nutrition, and reproduction.
6. Achieve a basic understanding of health and disease mechanisms.
7. Understand the ethics and profession of veterinary medicine.

*Skills and Career Competencies* objectives are as follows:

1. Communicate effectively in oral and written forms.
2. Achieve quantitative competency.
3. Conduct scientific literature searches using modern methods.

### **Equine Science and Management Emphasis**

The following *Disciplinary Knowledge* objectives apply:

1. Attain knowledge in mathematics and basic sciences required for disciplinary competency.
2. Know the nature, intent, and scope of equine science and management.

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3. Attain depth in two subfields of equine science and management.
4. Achieve understanding in the disciplines of equine behavior, health, nutrition, and reproduction of horses.
5. Integrate knowledge from the various disciplines to effectively conduct equine operations.

*Skills and Career Competencies* objectives are as follows:

1. Comprehend reading materials appropriate to course levels.
2. Communicate effectively in oral and written forms.
3. Conduct library research using modern methods.
4. Use a computer for written work, presentations, and research.
5. Attain proficiency in basic techniques of equine science and management.

## Undergraduate Research Opportunities

Students interested in pursuing undergraduate research opportunities in the ADVS Department should contact Tami Spackman, Agricultural Science 242, tami.spackman@usu.edu, (435) 797-2150, for information and referrals.

## Departmental Honors

Students who would like to experience greater academic depth within their major are encouraged to enroll in departmental honors. Through original, independent work, Honors students enjoy the benefits of close supervision and mentoring, as they work one-on-one with faculty in select upper-division departmental courses. Honors students also complete a senior project, which provides another opportunity to collaborate with faculty on a problem that is significant, both personally and in the student's discipline. Participating in departmental honors enhances students' chances for obtaining fellowships and admission to graduate school.

ADVS students qualify for acceptance into the departmental honors program by having a cumulative GPA of 3.3 or better at the time of application. The program of study requires the completion of 15 credits of upper-division (3000-level or above) classwork as follows: One credit of HONR 4800, Thesis/Project Seminar; 3 to 6 credits of HONR 4900, Senior Thesis/Project; and 8 to 11 credits of upper-division Honors coursework by contract (3 credits may be taken outside the ADVS Department). Completion of the degree requires a cumulative GPA of 3.3 and a 3.5 GPA in upper-division Honors classes. Examples of departmental classes which may be suitable as Honors courses by contract are ADVS 3000, 3200, 3500, 3510, 4200, 4560, 5160, 5240, 5260, 5350, 5400, 5520, 5530, 5690, 5700, and 5820. Students should plan their Honors Program early, so that their thesis project can be completed during the first semester of their senior year, and their last semester can be used to write and present their thesis.

Interested students should contact the Honors Program, Main 15, (435) 797-2715, honors@usu.edu. Additional information can be found online at: <http://www.usu.edu/honors/>

## Additional Information and Updates

For more information about Bachelor of Science requirements and the sequence in which courses should be taken, see major requirement sheets. For more information on ADVS Department minors, see minor requirement sheet. These are available from the ADVS Department advisor's office (AG S 242). Major requirement sheets can also be found online at: <http://www.usu.edu/majorsheets/>

For updated information on ADVS programs and course offerings, check the departmental home page at: <http://www.advs.usu.edu>

## Safety and Liability in Classes and Laboratories

Certain classes and laboratories involve a risk of bodily injury or of damage to clothing. Students should take appropriate precautions and wear suitable protective clothing. Some of the risks include handling or being near animals, slick floors or corrals, use of toxic or corrosive substances, and the use of sharp or breakable instruments and equipment. Students should take precautions to avoid fainting during demonstrations or work with animal tissues or operative procedures. Students must assume their own liability protection for travel to and from classes, laboratories, and field trips. The University and its employees assume no liability in the performance of classroom or laboratory instruction or on scheduled field trips, or for other dangerous activities. The student, by voluntarily participating in these classes and activities, agrees to assume the risk and not hold USU or its staff liable.

## Financial Support

In addition to the scholarships and other financial aid available through the University, the department awards designated scholarships to qualified students. The department employs students on a part-time basis to assist with its research and operate its animal facilities. The department also coordinates cooperative education and internship employment opportunities for students. For more information, contact the department.

## Graduate Programs

**Graduate Programs Coordinator:** Thomas D. Bunch  
**Location:** Agricultural Science 228  
**Phone:** (435) 797-2148  
**FAX:** (435) 797-2118  
**E-mail:** tom.bunch@usu.edu

## Admission Requirements

In addition to the general admission requirements (see pages 36-37), applicants should have satisfactory (3.0 GPA or better) grades in completion of previous degree programs. The GRE exam, as well as verbal and quantitative test scores at or above the 40th percentile, is required.

Applicants to the bioveterinary science graduate program should have a degree in bioveterinary science, biology, microbiology, chemistry, or one of the animal sciences. Preveterinary students oriented towards graduate research studies are strongly encouraged to apply.

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## Degree Programs

### Master of Science

The MS is available to qualified students with bachelor's degrees. MS degrees are offered by the department in animal science and dairy science, with five specializations in each, and in bioveterinary science.

### Doctor of Philosophy

The PhD degree in animal science is offered with four specializations. It is available to qualified students with degrees in related disciplines. Exceptionally well-qualified applicants may be considered for admission to a postbaccalaureate PhD program. The PhD degree in bioveterinary science is available to qualified students holding a DVM or a master's degree in a related discipline, or exceptionally well-qualified postbaccalaureate applicants. The PhD is a terminal research degree that is awarded upon successful completion of a comprehensive program of coursework and original research in an approved area of specialization.

### Course Requirements

Course requirements are determined by the student in consultation with and upon agreement by his or her supervisory committee. Depending on the research emphasis selected and the student's background, these requirements may be different for each student. Students working toward an MS or PhD degree must complete appropriate graduate-level statistics courses, as well as participate in the Animal, Dairy and Veterinary Sciences departmental seminar.

## Specializations in Animal/ Dairy Science

### Animal Nutrition

This specialization involves studies in biochemistry, principles of nutrition, animal management, nutritional physiology, and animal feedstuffs. Cooperation with producers, feed industry groups, other departments of the University, and USDA collaborators, along with research funding from private industry, strengthens the graduate program in this area.

### Breeding and Genetics

This specialization involves studies in quantitative genetics, applied animal genetics, statistics, and animal management. Cooperation with other departments, particularly the Department of Biology and the Department of Mathematics and Statistics, and collaboration with other research institutions, livestock producers, and commercial animal breeding companies broadens the resources of this graduate program.

### Molecular Biology

This specialization involves studies in molecular genetics, biochemistry of nucleic acids, cell biology, reproductive physiology, and bioveterinary science. Cooperation with other departments, particularly the Department of Biology and the Department of Chemistry and Biochemistry, the Biotechnology Center, and collaborators at other research institutions allows for a strong graduate program in this area.

### Reproductive Biology

This specialization involves studies in physiology and endocrinology of reproduction; embryo technology, including collection, culture, manipulation, storage, and transfer of embryos; disease transmission, cytogenetics and molecular genetics; and environmental and

toxicological influences on reproductive processes and fetal development. Cooperation with other departments and research centers of the University and with USDA collaborators allows for a strong graduate program in this area.

### Animal or Dairy Management (MS only)

This specialization involves studies in the applications of the principles of genetics, reproductive biology, and nutrition to animal or dairy management at an advanced level. Appropriate emphasis is also placed on statistics, economics and business administration, and range management. The management specialization offers the option of degree programs with or without thesis (Plan A or Plan B). Graduates in management from a program including thesis (Plan A) may pursue advanced studies in more specialized fields. The MS in management without a thesis (Plan B) is considered a terminal degree.

## Bioveterinary Science

This degree program involves studies in biochemistry, statistics, pathology, toxicology, virology, parasitology, pharmacology, and microbiology. Advanced techniques in laboratory procedures and animal health research are emphasized. Cooperation with other departments and research centers of the University and with federal collaborators and agencies allows for a strong graduate program in bioveterinary science.

## Research

The ADVS department conducts a broad range of basic and applied research in the areas of animal reproduction, animal nutrition, livestock and dairy management, animal health, virology, parasitology, toxicology, animal behavior, cytogenetics, and molecular genetics. Department facilities include over 30 research laboratories on campus and at local and regional animal research facilities. There are research herds and flocks of beef and dairy cattle, sheep, and swine housed close to the University. There are additional research units housing beef cattle, sheep, and turkeys located throughout the state. Research in the department is funded by a multimillion dollar budget derived from support by the Utah Agricultural Experiment Station and by substantial outside contracts and grants. Cooperation with other departments and research centers of the University and with federal collaborators enhances the ADVS research and graduate programs. Significant in this regard are the University Center for Integrated BioSystems, the Utah State Animal Disease Diagnostic Laboratories, the Laboratory Animal Research Center, the Center for Environmental Toxicology, the Center for the Genetic Improvement of Livestock, and the on-campus USDA Poisonous Plant Laboratory.

## Financial Assistance

Both departmental and research grant support are available to matriculated graduate students on a competitive basis. The department funds graduate assistantships, which are available on a competitive basis to matriculated graduate students who are U.S. citizens, nationals, or residents. Students interested in departmental assistantships may request an application form from the department or download the form at: <http://www.advs.usu.edu/academics/grad/> Applications for assistantships for the following academic year must be submitted by March 15.

Acceptance to graduate study in the ADVS Department does not constitute a guarantee of financial assistance.

# Department of Animal, Dairy and Veterinary Sciences

## Career Opportunities

Career opportunities are available for students who have earned graduate degrees in the MS and PhD programs offered by the ADVS Department as described below.

### Animal and Dairy Science Graduate Degree Programs

#### Animal Nutrition

Career opportunities exist in extension, university and private research, the commercial animal feedstuffs industry, private consulting firms, and international programs.

#### Breeding and Genetics

Career opportunities exist in extension university and private research, commercial animal breeding and genetic engineering enterprises, and international programs.

#### Molecular Biology

Career opportunities exist in university, federal, and private research organizations, and in commercial applications in the rapidly growing area of biotechnology.

#### Reproductive Biology

Career opportunities exist in extension; university and private research; the pharmaceutical, embryo transfer, and artificial insemination industries; private consultation; and international programs.

#### Animal or Dairy Management

Career opportunities include extension, private consultation firms, farm and ranch management, sales and service to agricultural producers, agricultural finance, and international programs.

### Bioveterinary Science Graduate Degree Programs

Career opportunities in this area exist in research, management, and submanagement positions in public and private health research and testing organizations, and in commercial industries in the health field. Graduates from the MS program may seek admission to advanced degree programs in the biological sciences or veterinary medicine.

## Animal, Dairy and Veterinary Sciences Faculty

#### Professors

*Thomas D. Bunch*, cytogenetics, embryo biology  
*Noelle E. Cockett*, molecular genetics, identification of genetic markers  
*Roger A. Coulombe, Jr.*, veterinary toxicology, molecular biology  
*Howard M. Deer*, pesticides, environmental toxicology  
*Jeffery O. Hall*, veterinary pathology, toxicology  
*Lyle G. McNeal*, sheep production, wool science  
*Kenneth L. White*, reproductive physiology, developmental biology  
*Dale R. ZoBell*, beef cattle production, management

#### Research Professors

*John D. Morrey*, virology, transgenic animals  
*Kamal A. Rashid*, in vitro mutagenesis and DNA repair  
*Donald F. Smee*, viral chemotherapy

#### Adjunct Professors

*J. Talmage Huber*, dairy nutrition  
*Amrit K. Judd*, medicinal chemistry as applied to treatment of viral diseases  
*Kip E. Panter*, animal science/toxicology  
*R. Dean Plowman*, dairy genetics, management  
*Rex S. Spendlove*, microbiology

#### Professors Emeritus

*Stanley D. Allen*, veterinary medicine, laboratory animal management  
*Clive W. Arave*, behavior, dairy genetics  
*Clell V. Bagley*, veterinary medicine  
*John E. Butcher*, ruminant nutrition  
*Jay W. Call*, veterinary medicine  
*Warren C. Foote*, reproductive physiology  
*Robert C. Lamb*, dairy genetics  
*James LeGrande Shupe*, veterinary science, comparative clinical medicine  
*Robert W. Sidwell*, virology  
*Ross A. Smart*, veterinary diagnostic pathology  
*Norris J. Stenquist*, livestock production, nutrition  
*Wallace R. Taylor*, dairy breeding, dairy herd improvement  
*Don W. Thomas*, veterinary medicine

#### Associate Professors

*Thomas J. Baldwin*, veterinary diagnostic pathology  
*David D. Frame*, poultry extension  
*Lee S. Rickords*, molecular genetics, developmental biology  
*Kerry A. Rood*, extension veterinarian  
*Allen J. Young*, dairy management, reproduction

#### Adjunct Associate Professors

*Dale R. Gardner*, chemistry/toxicology  
*Stephen T. Lee*, analytical chemistry  
*Bryan L. Stegelmeier*, pathology  
*Shiquan Wang*, cytogenetics, reproductive physiology  
*J. Christopher Wilson*, veterinary medicine, fisheries

#### Associate Professors Emeritus

*Larry M. Slade*, equine nutrition, management  
*Randall D. Wiedmeier*, beef cattle nutrition, management

#### Research Associate Professors

*Dale L. Barnard*, virology  
*Christopher J. Davies*, immunogenetics

#### Assistant Professors

*Jong-Su Eun*, ruminant nutrition  
*Patricia A. Evans*, equine management  
*Jessie D. Trujillo*, infectious disease, diagnoses and vaccine  
*David J. Wilson*, dairy cattle, mastitis

#### Adjunct Assistant Professors

*Benedict Green*, animal physiology  
*Breck D. Hunsaker*, veterinary immunology  
*Kevin Welch*, toxicology

#### Research Assistant Professors

*Brian B. Gowen*, immunology, virology  
*Justin G. Julander*, virology, microbiology  
*Bart E. Tarbet*, virology, microbiology

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## **Clinical Assistant Professors**

*E. Jane Kelly*, veterinary diagnostics

*Ramona T. Skirpstunas*, bacterial diseases of fish, veterinary pathology, veterinary laboratory diagnostic medicine

*Rusty D. Stott*, clinical veterinarian, animal health

## **Research Assistant Professor Emeritus**

*Robert E. Warnick*, turkey nutrition

## **Extension Associate Professor**

*Scott S. McKendrick*, animal science production

## **Lecturers**

*Brett R. Bowman*, animal science/nutrition

*Colette F. Floyd*, equine science and management

*Parl Galloway*, animal science, manager of Animal Science Farm

*Justin A. Jenson*, dairy herdsman coordinator, dairy youth specialist

*Rebecca A. Lewis*, equine science and management

## **Course Descriptions**

Animal, Dairy and Veterinary Sciences (ADVS), pages 491-496