

Department of  
**Animal, Dairy and Veterinary Sciences**

**College of Agriculture**

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**Degrees offered:** Bachelor of Science (BS) and Bachelor of Arts (BA) in Animal Science, Dairy Science, Bioveterinary Science; 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 and Molecular Biology are available through the Interdepartmental Toxicology and Molecular Biology programs

**Certificate Program:** Dairy Herdsman

## Undergraduate Programs

### Objectives

Bachelor's degree students majoring in animal or dairy sciences may choose a program from two career emphasis areas: **Science** or **Animal (Dairy) Industries**. The curricula in the animal and dairy sciences are designed to prepare students for a broad base of rewarding careers in the dynamic disciplines of animal ag-

riculture. Teaching and research facilities, flocks, and herds are available for "hands-on" practical laboratory experiences, along with faculty-mentored research projects. An assigned faculty advisor helps students develop, arrange, and expedite their personal undergraduate program.

Preveterinary bachelor's degree programs are intended to prepare students for admission to professional veterinary medical schools and/or graduate study in the biomedical sciences. A

preveterinary bachelor's degree is considered a nonterminal degree. Preveterinary students may earn a bachelor's degree in bioveterinary science, or in the science emphasis of animal science or dairy science with a preveterinary option.

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.

### **Animal and Dairy Sciences**

**Science Emphasis.** Designed for students desiring education beyond the bachelor's degree, this emphasis is a preparatory course of study for students who have a career interest in the following areas: animal research in genetics; reproductive biology, nutrition (public or private sector); biotechnology; teaching; and advanced degrees (MS, PhD, and veterinary school). The science emphasis requires an especially close student-advisor relationship, as post-graduate training is considered essential for professional success in these disciplines.

**Animal (Dairy) Industries Emphasis.** This emphasis is designed to prepare students who earn a bachelor's degree for the broadest range of career opportunities in animal agriculture. The Animal Industries Emphasis stresses both traditional skills in the areas of basic and applied animal sciences and related learning experiences in the other agricultural sciences, as well as in the areas of business administration, economics, and management. Students can select either an advanced research project or an internship experience in the animal industries as an integral component of their program of study during the junior or senior year. Graduates from this emphasis may seek career opportunities in production animal agriculture in farm or ranch 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, economics, accounting, agricultural real estate sales and appraisal, financing and credit operations, public policy, agricultural media and communications, insurance, commodity trading, animal product processing, agricultural cooperatives, and producer/commodity associations.

### **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, Oregon State University, and University of California at Davis. Students may also apply to other veterinary schools as out-of-state applicants.

### **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 science and dairy science programs 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 major. 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 major. 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 any bachelor's degree offered by the ADVS department. 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, animal science and dairy science bachelor's degree candidates must attain a grade point average of 2.25 in the ADVS courses specified as requirements in their respective emphasis curricula to graduate. Bioveterinary science degree candidates must attain an overall GPA of 3.0 to graduate.

### **Graduation Requirements**

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

#### **Animal/Dairy Science: Science Emphasis**

The following courses are required for students pursuing a bachelor's degree in the animal science or dairy science Science Emphasis: ADVS 1110, 1910, 2200, two 2000-level species production practices courses (A), 2130 (D), 3000, 3500, 3510, 4200, 4250 or 4800, 4560, 4910, 4920, two 5000-level species management courses (A), 5130 (D); ASTE 3090 (D); Biol 1210, 1220, 3200, 3300; Chem 1210, 1220, 1230, 1240, 2310, 2320, 2330, 3700; Math 1050; Math 1100 or 1210; Stat 2000.

#### **Animal/Dairy Science: Industries Emphasis**

The following courses are required for students pursuing a bachelor's degree in the animal science or dairy science Animal (Dairy) Industries Emphasis: ADVS 1110, 1250, 1910, 2200, three 2000-level species production practices courses (A), 2130 (D), 3000, 3300, 3500, 3510, 3650 (A), 4200, 4250 or 4800, 4560, 4910, 4920, two 5000-level species management courses (A), 5030 (A), 5130 (D), 5520 (A); ASTE 3050; Biol 1010; Chem 1110, 1120; Econ 1500; Math 1050; NFS 5030 (D); Soil 2000 or 3000 (D); Stat 1040 or 2000 or 2300. In addition, students majoring in this emphasis must choose three directed elective courses in animal management from the following: ADVS 5030 (D), one 5000-level species management course in addition to the two courses required for the major (A), 5520 (D), 5530, 5860 (A); ASTE 3090 (D), 3600 (D), 4100 (D); NFS 5020 (A); PISc 4320;

FRWS 4000 (A); Soil 2000 or 3000 (A). Furthermore, students majoring in this emphasis must choose four directed elective courses in industry from the following: Acct 2010; ASTE 3090 (A); BA 3400, 3500, 3700; Econ 2010, 3030, 3050, 4010, 4030, 5030; MHR 2990, 3110.

### Biovetterinary Science

This curriculum includes those courses required for application to WICHE veterinary schools after three years of study. Requirements are as follows:

**Freshman year:** ADVS 1110, 1920, 2200; Chem 1210, 1220, 1230, 1240; Engl 1010; Math 1050; one University Studies Breadth course.

**Sophomore year:** ADVS 2920; Biol 1210, 1220; Chem 2310, 2320, 2330; Math 1100; Stat 1040; one University Studies Breadth course; electives.

**Junior year:** ADVS 3000; Biol 3200; Chem 3700, Engl 2010; Phyx 2110, 2120; one University Studies Breadth course; one University Studies Depth course; electives.

**Senior year:** Choose from among the following courses to complete the University requirements for the bachelor's degree: ADVS 3500, 3510, 4200, 4560, 5160, 5240, 5260, 5490, 5700; Biol 3300, 4200, 5150, 5330, 5340, 5600, 5620.

### BA Degree in Animal/Dairy/Biovetterinary Science

Students must complete requirements for the BS degree in these respective programs (see above), plus two years of a foreign language (see page 53 of this catalog).

### Honors

There is also an Honors Plan for students desiring a BA or BS degree "with Honors" in Animal/Dairy/Biovetterinary Science. 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 animal science and dairy science majors also apply to all minors (see page 120).

### 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.

**General Animal Science:** ADVS 1110, 2450; choose one or more courses from ADVS 2080, 2090, 2120, 2190; 6 elective ADVS credits with approval of an animal science advisor.

**General Dairy Science:** ADVS 1110, 2130, 2450; 6 elective ADVS credits with approval of a dairy science advisor.

**Biovetterinary Science:** ADVS 2200, 3000, 4200; 3 elective ADVS credits with approval of a biovetterinary science advisor.

**Horse Production:** ADVS 1110, 2190, 2250, 2450; 2 or more elective ADVS credits with approval of an animal science advisor.

**Horse Training:** ADVS 1110, 1600, 2190, 2600; 2 or more elective ADVS credits with approval of an animal science advisor.

**Dairy Herdsman:** ADVS 1020, 1030, 1040, 1050, 1060. (*Not available to Dairy Science Majors.*)

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

### 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 main office (AG S 230).

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 the student's entry into the department can keep academic problems to a minimum.

For updated information on ADVS programs and course offerings, check the departmental home page at:

<http://adv.susu.edu/adv/home.html>.

### 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 (for details, refer to Scholarships and Awards in the College of Agriculture in the Financial Aid section of this catalog, pages 26-29). 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.

(A) Required of Animal Science majors.

(D) Required of Dairy Science majors.

## Graduate Programs

### Admission Requirements

In addition to the general admission requirements (see pages 72-73), applicants should have satisfactory (3.0 GPA or better) grades in completion of previous degree programs. GRE exam, verbal, quantitative, and analytical scores at or above the 40th percentile are required.

The applicant for a graduate program in animal or dairy science should have completed a BS undergraduate program similar to the USU animal science or dairy science Science Emphasis BS degree. This background would include the following courses and their prerequisites: Biol 1210 and 1220 or their equivalents; Chem 2310 and 2320 or their equivalents; Math 1050 and Stat 1040 or their equivalents. Applicants with deficiencies in these areas may be admitted to the graduate program subject to the completion of remedial coursework specified by the department. Other preparatory courses may be specified by the student's supervisory committee.

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.

### 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 master's 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. 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.

### Specializations

**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.

*Course requirements:* Students in the MS program are required to complete the following courses: ADVS 6010, 6800, any four ADVS graduate nutrition courses at the discretion of the supervisory committee; one 5000-level Statistics course. Students in the MS program are required to complete or to have completed Chem 3700 or its equivalent, but will not receive graduate credit for it. Students in the PhD program are required to meet or have met all MS program requirements, as well as to complete the following coursework: ADVS 6800 (additional to the MS requirement), ADVS graduate nutrition courses as directed by the supervisory committee; Chem 5700, 5710; one 5000-level Statistics course (additional to the MS requirement); additional coursework at the

discretion of the supervisory committee to a total of at least 30 credits.

**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.

*Course requirements:* Students in the MS program are required to complete the following courses: ADVS 6010, 6300, 6800; Biol 6170, 6280; Stat 5110; and a minimum of 6 credits in the student's area of study. Students in the PhD program are required to complete the following courses in addition to those required for the MS degree: ADVS 6800, 6820; Math 5710, 5720; Stat 6710, 6720.

**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.

*Course requirements:* Students in the MS program are required to complete the following courses: ADVS 5160 or 5240 or 5260; ADVS 6010, 6800; Biol 4200 or 6210; Biol 5190; Stat 5200; and a minimum of 6 credits in the student's area of study. Students in the PhD program are required to complete the following courses in addition to those required for the MS degree: ADVS 6800; Chem 5700, 5710.

**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.

*Course requirements:* Students in the MS program are required to complete the following courses: ADVS 6010, 6200, 6800; Biol 4200; Stat 5200. Students in the PhD program are required to complete the following coursework additional to the MS requirements: ADVS 6800; Biol 5150, 6210; Chem 5700, 5710. Additional coursework for the MS and PhD degree may be required at the discretion of the supervisory committee.

**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.

*Course requirements:* Students choosing either the option with thesis (Plan A) or the option without thesis (Plan B) are required to complete the following courses: ADVS 6010, 6200, 6300, 6520

or 6530, 6800; plus one of the following (if comparable course not previously completed at the undergraduate level): ADVS 6080, 6090, 6120, 6130, 6190; one 5000-level Statistics course. Additional courses in related areas will be required as directed by the supervisory committee.

### ***Bioveterinary Science***

This degree program involves studies in biochemistry, statistics, pathology, theriogenology, toxicology, virology, parasitology, pharmacology, microbiology, and laboratory animal management. 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.

*Course requirements:* Students in the MS program are required to complete the following courses: ADVS 6010, 6700, 6800; Chem 5700; Stat 3000. Students in the PhD program are required to complete the following courses: ADVS 6010, 6700, 6710, 6800, 7890; Chem 5700, 5710; Stat 5200. Additional coursework will be required by the supervisory committee from among the following courses: ADVS 5260, 5750, 6200, 6350, 6490, 6500, 6600, 6710, 6820; Biol 5050, 5150, 5330, 5340; Chem 5700, 5710.

### ***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 Biotechnology Center, 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 a number of 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. 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.

### ***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.

#### **Bioveternary 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 Courses (ADVS)***

**ADVS 1010. Artificial Insemination and Reproduction.** Principles of reproduction, artificial insemination, and handling of semen. Anatomy and physiology of the bovine reproductive tract and reproductive management of the dairy farm. (2 cr) (F)

**ADVS 1020. Dairy Cattle Nutrition and Feeding.** Applied approach to nutrients, feeds, digestion, and nutrient utilization by dairy cattle. Dietary requirements and feeding practices. (3 cr) (F)

**ADVS 1030. Lactation and Milking Systems.** The mammary gland, udder health, and mastitis and its control. Milk quality and marketing. Principles involved in the function, design, and maintenance of dairy equipment. (3 cr) (Sp)

**ADVS 1040. Records and Financial Aspects of Dairy Herd Operations.** Record keeping systems, tax records, estate planning, DHI records, and computer record systems. Principles of credit and finance. Accessing loan sources. (3 cr) (Sp)

**ADVS 1050. Dairy Genetics.** Principles of dairy genetics, mating, pedigrees, and breeding. Purebred cattle type traits and classification. (3 cr) (F)

**ADVS 1060. Applied Feeding and Management of Dairy Calves and Basic Construction of Facilities.** Practical experience in feeding and management of dairy

calves from birth to weaning. Students participate in actual calf-raising programs. Development of basic skills required for planning and building agricultural structures. (3 cr) (Sp)

**ADVS 1100. Small Scale Animal Production.** Fundamentals of raising domestic farm animals in a semi-rural, noncommercial setting. Considerations of feeding, breeding, housing, marketing, sanitation, general health care, and community zoning factors. For nonmajors. (3 cr) (F)

**ADVS 1110. Introduction to Animal Science.** Influence and contributions of animal production and its commodities to society. Introductory scientific principles of animal science, livestock production systems, and contemporary issues. Introduction to professions and careers in animal agriculture and veterinary sciences. (4 cr) (F,Sp)

**ADVS 1250 (QI). Applied Agricultural Computations.** Development of understanding and proficiency in the application of basic mathematical skills, including algebra and geometry, to practical computational situations encountered in the agricultural sciences. (2 cr) (F,Sp)

**ADVS 1600. Western Horsemanship I.** Grooming, saddling, bridling, mounting, seats and hands, horseback riding both bareback and on western saddle. For students with limited or no previous riding experience. Western-type riding boots and health insurance required. (2 cr) (F,Sp)

**ADVS 1720. Dairy Cattle Evaluation and Judging.** Evaluation of cattle based on exterior anatomical traits functional for improving longevity and milk production. Explanation of classification systems used by breed associations and the artificial insemination industry. Development of basic skills for preparing dairy cattle for show. (1 cr) (Sp)

**ADVS 1910. Orientation to Animal and Dairy Science.** Introduction to the Animal Science and Dairy Science programs, and to the opportunities in animal agriculture and related fields. (0.5 cr) (F)

**ADVS 1920. Orientation to Bioveterinary Science.** Introduction to the profession of veterinary medicine and related fields, and to the preparation required for veterinary medical careers. (1 cr) (F)

**ADVS 2080. Beef Production Practices.** Production practices in the handling, selection, and care of beef cattle. Demonstrations of equipment, facilities, and skills relevant to beef cattle production. Prerequisite: ADVS 1110 (may be taken concurrently) or permission of instructor. (2 cr) (Sp)

**ADVS 2090. Sheep Production Practices.** Production practices in the handling, selection, and care of sheep. Demonstrations of equipment, facilities, and skills relevant to sheep and wool production. Prerequisite: ADVS 1110 (may be taken concurrently) or permission of instructor. (2 cr) (Sp)

**ADVS 2120. Swine Production Practices.** Production practices in the selection, handling, and care of swine. Demonstrations of equipment, facilities, and skills relevant to swine industry. Prerequisite: ADVS 1110 (may be taken concurrently) or permission of instructor. (2 cr) (Sp)

**ADVS 2130. Dairy Production Practices.** Basic husbandry skills needed to carry out day-to-day operations on a dairy farm. Principles of dairy herd health, disease prevention, and treatment. Prerequisite: ADVS 1020 or 1110 (may be taken concurrently) or permission of instructor. (3 cr) (F)

**ADVS 2190. Horse Production Practices.** Production practices in the selection, care, and evaluation of horses. Survey of breeds of horses, their characteristics, and their uses, as well as equine behavior, health care, nutrition, reproduction, anatomy, and physiology. Prerequisite: ADVS 1110 (may be taken concurrently) or permission of instructor. (2 cr) (F)

**ADVS 2200. Anatomy and Physiology of Animals.** Normal structure and function studied systematically. Comparative livestock, poultry, pleasure and companion animals, laboratory animals, and humans. (4 cr) (Sp)

**ADVS 2250. Cooperative Work Experience.** For students who require animal industry experience to prepare them for advanced curriculum in Animal, Dairy, or Bioveterinary Science. (1-12 cr) (F,Sp,Su) ®

\***ADVS 2450. Animal Feeds and Feeding Practices.** Feed composition and characteristics influencing animal performance. Digestion of feeds and nutrient utilization by animals. Ration formulation and feeding strategies. For nonmajors (4 cr) (F)

**ADVS 2600. Western Horsemanship II.** Alternative training techniques for western pleasure and western reining horses, teaching leads, cueing techniques, reining maneuvers, and show-style riding. Western-type riding boots and health insurance required. Prerequisite: ADVS 1600. (2 cr) (F,Sp)

**ADVS 2920. Orientation to Veterinary Medicine.** Preparation of preveterinary students for successful application and admission to professional veterinary schools. Taught first half of spring semester. (0.5 cr) (Sp)

**ADVS 3000. Animal Health and Hygiene.** Introduction to basic principles of disease. Agents, mechanisms, and preventive measures for common diseases of farm animals will be emphasized. Prerequisite: ADVS 2200. (3 cr) (Sp)

**ADVS 3200 (DSC). Ethical Issues in Genetic Engineering and Biotechnology.** Critical evaluation of ethical issues of genetic engineering in biotechnology, including biological engineering and cloning of plants, animals, and humans. Presents basic science of genetic engineering and biotechnology. (3 cr) (Sp)

**ADVS 3300 (CI). Animal Production and Public Policy.** Students identify problems, become involved, organize resources, read and analyze documents, see different sides of an issue, and arrive at workable solutions for dealing with contemporary forces in society impinging on the ability of farmers and ranchers to function. (2 cr) (F)

**ADVS 3500. Principles of Animal Nutrition.** Biochemical characterization and chemical analysis of feedstuffs for farm animals, with regard to carbohydrates, proteins, lipids, minerals, and vitamins. Catabolic/anabolic pathways associated with utilization of these nutrients with respect to production, general health, and nutritional disorders. Prerequisites: ADVS 2200; Chem 1120 or 2320. (3 cr) (F)

**ADVS 3510 (QI). Applied Animal Nutrition.** Categorization of farm animal feeds into energy feeds, protein feeds, dry forages, silages and haylages, pasture and range plants, and vitamin-mineral supplements. Emphasis placed on practical diet formulation, including computerization and aspects of feed delivery and nutritional management. Prerequisite: ADVS 3500 or Chem 3700. (3 cr) (Sp)

**ADVS 3600. Western Horsemanship III.** Utilization of current training methods relating to basic equine behavior, ground breaking skills, and riding and training of the unbroken and freshly broken horse. Prerequisite: ADVS 2600. (2 cr) (F)

**ADVS 3650. Live Animal and Carcass Evaluation.** Judging, grading, and pricing of market animals and carcasses, with emphasis on comparative evaluation of live animals and carcasses. (3 cr) (F)

**ADVS 3710. Advanced Livestock Judging.** Advanced methods of selection and identification of superior animals for breeding stock. Emphasis on performance records, judging, grading, and oral reasons. (2 cr) (F,Sp)

**ADVS 3900. Special Problems and Readings.** Students conduct short-term studies and/or literature review with critical analysis of individualized subject matter. Formal written reports required. Prerequisite: Permission of instructor. (1-3 cr) (F,Sp,Su) ®

**ADVS 3910. Special Topics.** Topics of special interest to those who have needs not satisfied by courses currently offered. (1-5 cr) (F,Sp,Su) ®

**ADVS 3920. Internship in Veterinary Medicine.** A directed and evaluated work experience with a veterinarian. For each credit, student must document at least 54 hours of work time. Prerequisite: Permission of instructor. (1-3 cr) (F,Sp,Su) ®

**ADVS 4200 (CI). Physiology of Reproduction and Lactation.** Introduction to principles of physiology as they relate to the reproductive and lactation processes in domestic mammals. Factors affecting reproductive and lactation performance and their applications in animal management. Prerequisites: ADVS 2200; Chem 1120 or 2310. (4 cr) (Sp)

**ADVS 4250. Internship in Animal Industry.** Directed and evaluated educational work experience with an animal production unit, related business, or government facility in cooperation with the Livestock Education Foundation. Prerequisite: Permission of instructor. (1-12 cr) (F,Sp,Su) ®

**ADVS 4560 (QI). Principles of Animal Breeding.** Genetic influences affecting animal performance and the application of selection principles, breeding systems, and methods of improvement to farm animals, including beef and dairy cattle, sheep, swine, and horses. Prerequisite: Biol 1010 or 1220. (3 cr) (F)

**ADVS 4800. Undergraduate Research or Creative Opportunity.** Research or creative activity pertaining to animals. May include management, production, medical, or basic science, with consideration of biological, chemical, or physical aspects, or instrument design. Prerequisite: Permission of instructor. (1-6 cr) (F,Sp,Su) ®

**ADVS 4910. Preprofessional Orientation.** Survey of the professional opportunities in the animal industries to enable graduating students to make the transition to careers and/or postgraduate study. Prerequisite: Senior standing. (0.5 cr) (F)

**ADVS 4920 (CI). Undergraduate Seminar.** Current developments in agricultural field selected by student. Each student is responsible for the research and oral presentation of a topic in the animal industries. Group investigations, preparations, and deliberations on issues in animal agriculture. Prerequisite: Senior standing. (2 cr) (F)

**ADVS 5030. Sustainable Agricultural Production Systems with Animals.** Study of various domestic animal production systems in relation to sustainable agriculture and integrated ranch and farm management strategies. Consideration of environmental factors and overall profitability. Prerequisite: ADVS 1110. (3 cr) (F)

**ADVS 5080 (d6080).<sup>1</sup> Beef Cattle Management.** Managing the beef enterprise to yield optimum returns through integrating resource use and applying breeding, nutrition, reproduction, and animal health practices. Prerequisites: ADVS 2080; ADVS 3510, 4200, 4560 (may be taken concurrently). (3 cr) (Sp)

**ADVS 5090 (d6090). Sheep Management and Wool Technology.** Detailed study of the managerial considerations for range and farm flock operations. Examinations of wool, and review of wool clip handling and merchandising. Prerequisites: ADVS 2090; ADVS 3510, 4200, 4560 (may be taken concurrently). (4 cr) (Sp)

**ADVS 5120 (d6120). Swine Management.** Management decisions based on nutrition, breeding programs, herd health practices, herd records, and marketing opportunities. Prerequisites: ADVS 2120; ADVS 3510, 4200, 4560 (may be taken concurrently). (3 cr) (Sp)

**\*ADVS 5130 (d6130). Dairy Cattle Management.** Capstone course drawing together concepts and applying them to a total dairy farm management program. Prerequisites: ADVS 2130; ADVS 3510, 4200, 4560 (may be taken concurrently). (3 cr) (Sp)

**ADVS 5160. Methods in Biotechnology: Cell Culture.** Techniques and fundamental knowledge for culturing mammalian and insect cells. Students will learn maintenance, growing, genetic engineering of cells, cytotoxicity, hybridoma creation, cloning, etc. Extensive laboratory experience is provided. Also taught as Biol 5160, Chem 5160, NFS 5160, and PSB 5160. (3 cr) (Sp)

**ADVS 5190 (d6190). Horse Management.** Management decisions in horse enterprises emphasizing business procedures, including merchandising, records, selection, uses, housing, facilities, nutrition, feeding, health care, and breeding. Emphasizes total management of horse enterprise, rather than husbandry. Prerequisites: ADVS 2190; ADVS 3510, 4200, 4560 (may be taken concurrently). (3 cr) (Sp)

**ADVS 5240. Methods in Biotechnology: Protein Purification Techniques.** Reviews basic methods of protein purification, including scaled-up use of 100L fermenter, large-scale centrifugation, diafiltration, chromatography, and use of BioCAD. Prerequisite: Chem 3700. Also taught as Biol 5240, Chem 5240, NFS 5240, and PSB 5240. (3 cr) (Sp)

**ADVS 5260. Methods in Biotechnology: Molecular Cloning.** Laboratory-oriented course designed to teach molecular biology techniques such as DNA cloning, genetic probes, polymerase chain reaction, and DNA sequencing. Prerequisite: Chem 3700 or 5710; or Biol 3200; or permission of instructor. Also taught as Biol 5260, Chem 5260, NFS 5260, and PSB 5260. (3 cr) (F)

**ADVS 5350 (d6350). Introductory Pharmacology and Pharmacokinetics.** Basic principles of pharmacology and pharmacokinetics providing basis for extrapolation of biological kinetics of foreign compounds to a wide variety of xenobiotics encountered in toxicology, biology, and research. Prerequisites: Biol 5600, Chem 3700. (3 cr) (Sp)

**ADVS 5400 (d6400). Environmental Toxicology.** Presents in-depth survey of toxic chemicals present in the environment, environmental factors impacting fate of chemicals, potential biological effects associated with chemical exposures, and methods of reducing associated risks. Prerequisite: Chem 3700. (3 cr) (Sp)

**ADVS 5490 (d6490). Research Animal Techniques.** Methods of live animal research including laboratory animals and livestock. Required to utilize those species of animals included under PHS Policy and by the Animal Welfare Act. Includes discussion of Institutional Animal Care and Use Committees (IACUC). (1 cr) (F,Sp) ®

**\*\*ADVS 5520 (d6520). Grazing Livestock Nutrition and Management.** Principles of livestock nutrition and production applied to the grazing environment and the relationships of livestock and range management for optimizing values from both. Prerequisites: ADVS 3510; FRWS 4000 (recommended). (2 cr) (Sp)

**\*ADVS 5530 (d6530). Nutritional Management of Farm Animals.** Nutritional management, problem solving, and feeding strategies as they influence performance of farm animals. Optimization of nutrition for various species and classes of domestic livestock. Prerequisite: ADVS 3510. (3 cr) (Sp)

**ADVS 5690 (d6690). Animal Histology.** Microscopic anatomy and physiology of normal domestic animal's cells, tissues, organs, and system. Prerequisite: ADVS 2200 or permission of instructor. (3 cr) (F)

**ADVS 5700 (CI) (d6700). General Animal Pathobiology.** Introduction to the principles of gross, microscopic, and physiological changes associated with diseases of domestic animals. Prerequisite: ADVS 5690/6690 or permission of instructor. (3 cr) (Sp)

**\*\*ADVS 5820 (d6820). Animal Cytogenetics and Gene Mapping.** Structure and properties of chromosomes, chromosome behavior during cell division, chromosomal influence on phenotype, and factors causing changes in chromosome structure and number. Gene markers and gene mapping, with emphasis on applications for livestock. Prerequisite: ADVS 4560 or Biol 3200. (3 cr) (F)

**\*\*ADVS 5860. Poisonous Range Plants Affecting Livestock.** Poisonous plants of rangelands and their effects on grazing animals, especially livestock. Management practices to reduce or prevent poisoning. Also taught as FRWS 5860. (2 cr) (Sp)

**ADVS 6010. Animal Research Orientation.** Orientation to graduate study and to research procedures and methods in the animal sciences, with introduction to the design and analysis of experiments, research ethics, and accessing research databases. For beginning graduate students. (1 cr) (F)

**ADVS 6080 (d5080). Beef Cattle Management.** Managing the beef enterprise to yield optimum returns through integrating resource use and applying breeding, nutrition, reproduction, and animal health practices. Prerequisites: ADVS 2080; ADVS 3510, 4200, 4560 (may be taken concurrently). (3 cr) (Sp)

**ADVS 6090 (d5090). Sheep Management and Wool Technology.** Detailed study of the managerial considerations for range and farm flock operations. Examinations of wool, and review of wool clip handling and merchandising. Prerequisites: ADVS 2090; ADVS 3510, 4200, 4560 (may be taken concurrently). (4 cr) (Sp)

**ADVS 6120 (d5120). Swine Management.** Management decisions based on nutrition, breeding programs, herd health practices, herd records, and marketing opportunities. Prerequisites: ADVS 2120; ADVS 3510, 4200, 4560 (may be taken concurrently). (3 cr) (Sp)

**\*ADVS 6130 (d5130). Dairy Cattle Management.** Capstone course drawing together concepts and applying them to a total dairy farm management program. Prerequisites: ADVS 2130; ADVS 3510, 4200, 4560 (may be taken concurrently). (3 cr) (Sp)

**ADVS 6190 (d5190). Horse Management.** Management decisions in horse enterprises emphasizing business procedures, including merchandising, records, selection, uses, housing, facilities, nutrition, feeding, health care, and breeding. Emphasizes total management of horse enterprise, rather than husbandry. Prerequisites: ADVS 2190; ADVS 3510, 4200, 4560 (may be taken concurrently). (3 cr) (Sp)

**\*\*ADVS 6200. Physiology of Reproduction.** Study of processes of reproduction in mammals, including fertilization, embryonic development, reproductive endocrinology, and mechanisms of control. Prerequisites: ADVS 4200, Chem 3700. (3 cr) (Sp)

**\*ADVS 6300. Animal Breeding Theory.** Basic theoretics of populations as applied to breeding and improvement of domestic animals with emphasis on effects of directed selection and mating and design of effective breeding plans. Prerequisite: ADVS 4560. (3 cr) (F)

**ADVS 6350 (d5350). Introductory Pharmacology and Pharmacokinetics.** Basic principles of pharmacology and pharmacokinetics providing basis for extrapolation of biological kinetics of foreign compounds to a wide variety of xenobiotics encountered in toxicology, biology, and research. Prerequisites: Biol 5600, Chem 3700. (3 cr) (Sp)

**ADVS 6400 (d5400). Environmental Toxicology.** Presents in-depth survey of toxic chemicals present in the environment, environmental factors impacting fate of chemicals, potential biological effects associated with chemical exposures, and methods of reducing associated risks. Prerequisite: Chem 3700. (3 cr) (Sp)

**ADVS 6490 (d5490). Research Animal Techniques.** Methods of live animal research including laboratory animals and livestock. Required to utilize those species of animals included under PHS Policy and by the Animal Welfare Act. Includes discussion of Institutional Animal Care and Use Committees (IACUC). (1 cr) (F,Sp) ®

**ADVS 6500. Animal Nutrition Research Techniques.** Laboratory intensive course in routine feedstuff evaluation and research techniques to evaluate nutritional and metabolic responses under in vivo, in situ, and in vitro conditions using feed, digesta, feces, urine, tissue, metabolites, and products. Prerequisite: ADVS 3510. (2 cr) (F)

**\*ADVS 6510 (d7510). Rumen Physiology and Metabolism.** Discussion of some key aspects of physiology and metabolism of the ruminant digestive tract, with emphasis on the rumen. Topics include anatomy and function; motility; metabolism of protein, carbohydrates, and lipids; rumen microbiology; and common digestive disorders. Prerequisite: ADVS 3510. (2 cr) (F)

**\*\*ADVS 6520 (d5520). Grazing Livestock Nutrition and Management.** Principles of livestock nutrition and production applied to the grazing environment and the relationships of livestock and range management for optimizing values from both. Prerequisites: ADVS 3510; FRWS 4000 (recommended). (2 cr) (Sp)

**\*ADVS 6530 (d5530). Nutritional Management of Farm Animals.** Nutritional management, problem solving, and feeding strategies as they influence performance of farm animals. Optimization of nutrition for various species and classes of domestic livestock. Prerequisite: ADVS 3510. (3 cr) (Sp)

**\*\*ADVS 6540 (d7540). Animal Energetics and Nutrient Metabolism.** Techniques and procedures in measurement of heat production; factors affecting heat production; efficiency of energy utilization in body processes such as work, growth, and synthesis of fats, proteins, and carbohydrates; and the energetic costs of nutrient interconversion and turnover. Prerequisites: ADVS 6510/7510; Chem 5700, 5710. (3 cr) (F)

**\*\*ADVS 6550 (d7550). Protein Metabolism and Utilization.** Processes involved in the digestion, synthesis, and degradation of protein in the rumen, with special emphasis on protein-energy relationships in the rumen and whole animal. Discussion of protein requirements and efficiency of protein utilization. Prerequisite: ADVS 6510/7510. (3 cr) (F)

**\*ADVS 6560 (d7560). Mineral and Vitamin Metabolism.** Principal roles of minerals and vitamins in nutrient metabolism as they apply to animal nutrition. Prerequisite: ADVS 6510/7510. (3 cr) (F)

**\*\*ADVS 6600 (d7600). Principles of Toxicology.** Mechanisms of action and effects of toxicants on living organisms. Prerequisite: ADVS 5350/6350. (3 cr) (F)

**ADVS 6690 (d6690). Animal Histology.** Microscopic anatomy and physiology of normal domestic animal's cells, tissues, organs, and system. Prerequisite: ADVS 2200 or permission of instructor. (3 cr) (F)

**ADVS 6700 (d5700). General Animal Pathobiology.** Introduction to the principles of gross, microscopic, and physiological changes associated with diseases of domestic animals. Prerequisite: ADVS 6690/5690 or permission of instructor. (3 cr) (Sp)

**ADVS 6800. Animal, Dairy and Veterinary Science Seminar.** Seminars on topics of interest in Animal, Dairy and Veterinary Sciences. (1 cr) (F,Sp)

**ADVS 6810. Seminar in Toxicology.** Graduate seminar in toxicology and related topics. (1 cr) (Sp) ®

**\*\*ADVS 6820 (d5820). Animal Cytogenetics and Gene Mapping.** Structure and properties of chromosomes, chromosome behavior during cell division, chromosomal influence on phenotype, and factors causing changes in chromosome structure and number. Gene markers and gene mapping, with emphasis on applications for livestock. Prerequisite: ADVS 4560 or Biol 3200. (3 cr) (F)

**ADVS 6900. Special Problems.** Readings, discussions, lectures, literature reviews, and research problems in animal, dairy, and bioveterinary sciences. Prerequisite: Consent of instructor and department. (1-3 cr) (F,Sp,Su) ®

**ADVS 6910. Readings and Conference in Pharmacology and Toxicology.** Independent readings and conferences in the area of pharmacology and toxicology with particular emphasis on current literature. Prerequisite: ADVS 6350/5350. (1-3 cr) (F) ®

**ADVS 6970. Research and Thesis.** (1-12 cr) (F,Sp,Su) ®

**ADVS 6990. Continuing Graduate Advisement.** (1-3 cr) (F,Sp,Su) ®

**\*ADVS 7510 (d6510). Rumen Physiology and Metabolism.** Discussion of some key aspects of physiology and metabolism of the ruminant digestive tract, with emphasis on the rumen. Topics include anatomy and function; motility; metabolism of protein, carbohydrates, and lipids; rumen microbiology; and common digestive disorders. Prerequisite: ADVS 3510. (2 cr) (F)

**\*\*ADVS 7540 (d6540). Animal Energetics and Nutrient Metabolism.** Techniques and procedures in measurement of heat production; factors affecting heat production; efficiency of energy utilization in body processes such as work, growth, and synthesis of fats, proteins, and carbohydrates; and the energetic costs of nutrient

interconversion and turnover. Prerequisites: ADVS 7510/6510; Chem 5700, 5710. (3 cr) (F)

**\*\*ADVS 7550 (d6550). Protein Metabolism and Utilization.** Processes involved in the digestion, synthesis, and degradation of protein in the rumen, with special emphasis on protein-energy relationships in the rumen and whole animal. Discussion of protein requirements and efficiency of protein utilization. Prerequisite: ADVS 7510/6510. (3 cr) (F)

**\*ADVS 7560 (d6560). Mineral and Vitamin Metabolism.** Principal roles of minerals and vitamins in nutrient metabolism as they apply to animal nutrition. Prerequisite: ADVS 7510/6510. (3 cr) (F)

**\*\*ADVS 7600 (d6600). Principles of Toxicology.** Mechanisms of action and effects of toxicants on living organisms. Prerequisite: ADVS 5350/6350. (3 cr) (F)

**ADVS 7970. Dissertation Research.** (1-12 cr) (F,Sp,Su) ®

**ADVS 7990. Continuing Graduate Advisement.** (1-9 cr) (F,Sp,Su) ®

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<sup>1</sup> Parenthetical numbers preceded by *d* indicate a *dual* listing.

® Repeatable for credit. Check with major department for limitations on number of credits that can be counted for graduation.

\*Taught 2002-2003.

\*\*Taught 2003-2004.