

# ANIMAL SCIENCE

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Department Head: Jaymie Noland

## Academic Programs

Program name	Program type
Animal Science	BS
Dairy Products Technology	MPS
Dairy Industries	Minor
Dairy Science	BS
Equine Science	Minor
Meat Science and Processing	Minor
Poultry Management	Minor
Rangeland Resources	Minor

Animal Science offers programs in both Animal and Dairy Sciences. Students have the opportunity to apply the principles of animal biology, husbandry and behavior, with molecular biology and other life sciences to a variety of species. Students can apply these principles to farm animals, exotic animals, laboratory animals, and to their own pets. The curriculum is very flexible, which allows students to work with their faculty advisor to plan an individual curriculum in line with their interests and career goals. This is a comprehensive “hands-on, learn-by-doing” program, so students work with animals of several species on a regular basis. Students learn the science and practical applications to be effective problem-solvers and leaders as they move on to professional and graduate schools, animal production and management, animal and dairy food processing, or numerous other career opportunities.

Students may select coursework in one of the following areas: pre-veterinary medicine, food animal production, dairy science, equine science, poultry management, agribusiness, biotechnology, comparative animal biology studies, rangeland resource management, dairy products technology and meat science.

The department offers a wide assortment of co-curricular activities including five different student clubs, competitive livestock and horse judging teams and intercollegiate dressage and equestrian teams. Students participate in organizing and conducting service meetings, seminars and field days sponsored by the department.

In addition, students are involved with faculty in research and development of new technologies related to animal health, production, and processing, using state-of-the-art equipment, facilities and technologies. Through extensive undergraduate research opportunities, students are prepared for careers in discovery, science and innovation.

## Experiential Learning

The Animal Science Department has extensive modern animal facilities for hands-on experience. The department is supported by state-of-the-art biotechnology labs, a new beef center, beef cattle evaluation center, new animal nutrition center for animal food manufacturing, and an extensive equine center with breeding barn, labs, new stalls and training arenas. Additionally, students are able to use nearly 6,000 acres of rangeland, a swine center, sheep center, a state-of-the-art poultry center, an on-campus veterinary clinic for student learning and a new meat processing

center. The modern dairy facility includes the Dairy Cattle Instructional Building, containing the milking parlor, meetings rooms and classrooms, a nutrition and physiology lab, a microbiology lab, and a computer lab dedicated to dairy management and application software. The campus creamery is well-equipped with modern processing equipment. Students are employed on a part-time basis to work in both the production and processing areas.

The department maintains beef cattle, a dairy herd, horses, sheep, swine, and poultry. The dairy herd includes 110 each of milking-age registered Jerseys and Holsteins, located on a well-planned unit where feeding, milking, calf raising, artificial insemination, and management are carried out. Both herds are recognized for their high production and outstanding type. Animal operations are supported by an on-campus veterinary clinic, dairy processing and meat processing facilities, and an animal nutrition center. By actively participating in the management of the herds and flocks, students simulate the larger commercial operations of the industry. The enterprise system is another valuable experience for students, and industry internships are strongly encouraged.

## Swanton-Pacific Ranch

The department has an active role in the management of the Swanton-Pacific Ranch and is developing environmentally sound resource management practices including intensive controlled grazing, multiple species grazing, and using the grazing animal as a tool to enhance the total environment of the ranch. Cal Poly's Animal Science major provides the knowledge and understanding to apply new technologies for the fast-changing, technology-driven world in which we live. The department's focus is to help students build a plan for personal and professional growth. Students develop the ability to apply and manage technology, and they also learn how to be team players, with the ability to solve problems utilizing leadership and professional communication skills. Most importantly, students are taught how to learn so they can adapt to the future.

## Leprino Foods Dairy Innovation Institute

The Leprino Foods Dairy Innovation Institute houses the Cal Poly Creamery, Dairy Products Technology Center (DPTC) and the Master of Professional Studies in Dairy Products Technology program. The DPTC focuses on multidisciplinary dairy foods research and training activities designed to support the dairy industry and consumers of dairy products. Current research areas are: cheese chemistry and technology, bioseparation processes, and new product and process development. The Center has state-of-the-art research and development as well as technology transfer facilities. Students may conduct dairy foods related research projects under the guidance of Dairy Science faculty. Opportunities also exist to work on joint projects with other institutions.

## Undergraduate Programs BS Animal Science

Students in the Animal Science Department study a variety of disciplines including pre-veterinary medicine, animal biotechnology, food animal production in beef and dairy cattle, goats, sheep, and swine, comparative animal biology, equine science, poultry management, range resources management, and meat science.

Through the use of Cal Poly's extensive rangelands, irrigated pastures, housing and handling structures, as well as laboratory and research facilities, students learn the different areas of study in an experiential environment. This learn-by-doing approach gives students opportunities to work closely with animals and their professors. The

animal science major incorporates an assortment of interests with a flexible curriculum that integrates well with students' career goals.

## BS Dairy Science

The Bachelor of Science degree in Dairy Science is designed to prepare students for employment in the various phases of the dairy industry, as well as related fields. All students within the major take a common core of courses and select additional courses in an area of interest, which may include: dairy farm or plant management, processing technology, agriculture communication, management, preparation for graduate or veterinary school, and agriculture teaching.

## Dairy Industries Minor

The purpose of this science-based minor is to help students from other disciplines gain a basic understanding of the terminology and practices used within the two segments of the dairy industry. Two specialization areas are available within the Dairy Industries minor: Dairy Husbandry and Dairy Foods. Students may choose to pursue either specialization. After completion of the minor, students should have a basic understanding of cattle, dairy nutrition, milk production and management or dairy food processing, food quality and regulatory control. Prospective students should understand that completion of a basic level of introductory biology, chemistry, and statistics is assumed for this minor. In addition, some upper division courses may also require microbiology, organic/biochemistry and/or anatomy and physiology.

## Equine Science Minor

The Equine Science minor is designed for students interested in developing a knowledge of, and competency in, the areas of equine training, nutrition and reproduction. This science-based program exposes students to various aspects of the horse industry, including basic equine management, training, and breeding farm management. By completing this minor, students gain an understanding of the principles and practices used within the equine industry.

## Meat Science and Processing Minor

The minor incorporates knowledge of general food science, basic meat science and the principles and practices of adding value to raw materials through livestock harvesting, carcass fabrication and the manufacture of further processed meat and poultry products. Opportunities for business and management training are available. The minor meets the requirements needed to become eligible for jobs with the government or commercial meat processing firms and other businesses associated with the production of food products containing meat or poultry. In addition to the required courses, selected courses address basic principles of microbiology, food science, food sanitation and safety, food chemistry and process control procedures, and other optional courses are offered in agribusiness.

## Poultry Management Minor

The Poultry Management minor prepares students for a wide variety of positions in the commercial poultry industry and in many allied services related directly to the industry. Career opportunities are many and varied.

Students have an opportunity to conduct enterprise projects in the production of market eggs, hatching eggs, meat birds, replacement pullets, turkey, and game birds, which give them valuable experience in production techniques as well as exposure to a number of business activities related to production. Advanced students may have opportunities to study special topics related to problems in management of commercial poultry flocks.

The program is supported by a state-of-the-art poultry production facility. Cal Poly's Poultry Unit is now considered one of the best in the Western United States; it accommodates commercial laying hen operation, egg processing facility, hatching, meat processing facility and battery and floor pen research facilities. These production facilities allow students to gain hands-on learning which complements their formal class work, and provides real-world experience.

## Rangeland Resources Minor

The department participates in offering an interdisciplinary minor in Rangeland Resources. Please see College of Agriculture, Food and Environmental Sciences (<http://catalog.calpoly.edu/collegesandprograms/collegeofagriculturefoodenvironmentalsciences>) section for more information.

## Graduate Programs

Cal Poly offers a Master of Science degree in Agriculture with a specialization in Animal Science. Please refer to the MS Agriculture (<http://catalog.calpoly.edu/collegesandprograms/collegeofagriculturefoodenvironmentalsciences/#graduatetext>) section of the College of Agriculture, Food and Environmental Sciences.

## MS Agriculture, Specialization in Dairy Products Technology

Cal Poly offers a Master of Science degree in Agriculture with a specialization in Dairy Products Technology. Please refer to the MS Agriculture (<http://catalog.calpoly.edu/collegesandprograms/collegeofagriculturefoodenvironmentalsciences/#graduatetext>) section of the College of Agriculture, Food and Environmental Sciences.

## MPS Dairy Products Technology

The Master of Professional Studies in Dairy Products Technology is an innovative program designed to prepare students from technical disciplines for rewarding and lucrative careers in the large-scale industrial dairy foods manufacturing industry. The program recruits students with critical thinking and analytical skills they will have developed while obtaining degrees in physical sciences, certain life sciences, or other technical disciplines. Through the use of experience based learning and project-based learning students will develop the essential knowledge to succeed in the international dairy foods industry.

### Program of Study

Graduate students in the MPS in Dairy Products Technology program will be required to take a prescribed program of study that will give them the understanding of the industry structure, unit operations, sanitation, quality control and regulatory requirements. In addition, graduates will have developed the leadership skills and experience that is necessary to control and guide teams in industrial dairy plant operations. Three quarters of on campus course work will be followed by a one-quarter internship related to industrial dairy foods manufacturing. To graduate

with the MPS in Dairy Products Technology students must pass a one-day practical examination following the internship.

## Admission Requirements

A Bachelor degree obtained in a field with substantial analytical and critical thinking. Preference is given for degrees in physical or life sciences. Prospective students are required to submit a cover letter identifying interests, goals, and experience relevant to the MPS program and a resume. Submit a Graduate Record Exam (GRE) General Test scores electronically to Institution Code: 4038.

Those who do not possess a bachelor degree from a postsecondary institution where English is the principal language of instruction must take either the Test of English as a foreign language (TOEFL) or the International English Language Testing System (IELTS) exam.

The TOEFL must have been taken within the last two years with a minimum score of 550 (paper version), 213 (computerized version) or 80 (internet based). The minimum score for the IELTS is 6.5.

## ASCI Courses

### ASCI 101. Introduction to the Animal Sciences. 2 units

CR/NC

Term Typically Offered: F

Economic, environmental and societal impact of the livestock, poultry and horse industries. Basic terminology, anatomy, and physical requirements of animals. Career and academic planning. Co-curricular, extra-curricular, and post-graduate opportunities. Required of all first-time students in the Animal Science Department. Credit/No Credit grading only. 2 lectures.

### ASCI 112. Principles of Animal Science. 4 units

GE Area B2

Term Typically Offered: F, W, SP

Comparative physiology of digestive, endocrine, and reproductive systems in animals. Principles of nutrition, genetics, growth and development, behavior, food processing/safety of animals. Current issues in animal agriculture including biosecurity, animal welfare, and governmental safeguards for animal and human health. 4 lectures. Fulfills GE B2 except for ASCI majors.

### ASCI 200. Special Problems. 1-4 units

CR/NC

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 3 units per quarter. Credit/No Credit grading only.

### ASCI 203. Animal Parasitology. 3 units

Term Typically Offered: SP

Prerequisite: BIO 111 or BIO 161.

Identification, life cycles, prevention and control of the common external and internal parasites causing economic loss in livestock. 3 lectures.

### ASCI 211. Meat Science. 4 units

Term Typically Offered: F, W, SP

Muscle food processing methods and operations. Conversion of muscle to meat. Meat inspection, grading, composition, curing, preservation, food safety and related topics. Carcass beef, pork, and lamb processed into consumer ready products. 3 lectures, 1 laboratory.

### ASCI 212. Livestock Show Management. 3 units

Term Typically Offered: W

Application of the management and operations of Cal Poly's Western Bonanza Livestock Show. Principles and procedures in planning, organizing, financing, promoting and managing a major livestock show and the fair industry. Total credit limited to 6 units. Not open to students with credit for ASCI 412 or ASCI 413. 1 lecture, 2 activities.

### ASCI 214. Equine Management. 2 units

Term Typically Offered: W

Prerequisite: Consent of instructor.

Application of safety, risk reduction, horsemanship skills. Develop a working equine/human relationship. Selection and application of nutrition, equipment, preventive health and farrier program, and equitation skills. 2 laboratories.

### ASCI 220. Introductory Animal Nutrition and Feeding. 4 units

Term Typically Offered: F, W, SP

Prerequisite: BIO 111 or BIO 161; and CHEM 127.

Nutrient digestion and absorption; basic functions of major nutrient classes; NRC feed classification and feedstuff characteristics; Van Soest system of fiber analysis and practical applications; feed processing: effects on feeds and nutrient availability; nutrient requirements of animals; diet formulation techniques. 3 lectures, 1 laboratory.

### ASCI 221. Introduction to Beef Production. 4 units

Term Typically Offered: F, SP

Survey of industry characteristics, breeds, market classes, production systems, and current issues facing the beef industry. 3 lectures, 1 laboratory.

### ASCI 222. Systems of Swine Production. 4 units

Term Typically Offered: F, SP

Structure of the pork industry in the U.S.; production standards and new technologies; breed systems. Market classification, product quality and quality assurance. Swine behavior and husbandry systems; biosecurity, health and feeding systems and management. 3 lectures, 1 laboratory.

### ASCI 223. Systems of Small Ruminant Management. 4 units

Term Typically Offered: W, SP

Sheep and goat industry overview, populations, trends, cultural implications, breed identification, nutritional, reproductive, health, marketing, and herd management of sheep and goats. Field trip may be required. 3 lectures, 1 laboratory.

### ASCI 224. Equine Science. 4 units

Term Typically Offered: F, W, SP

History, status of the horse industry, breeds. Application of management skills, safety, conformation evaluation, hoof and leg conformation and care. Understanding equine behavior. Insurance and tax ramifications. Pedigree analysis. Alternate therapies. 3 lectures, 1 laboratory.

### ASCI 225. Introduction to Poultry Management. 4 units

Term Typically Offered: F, W, SP

Introduction to modern techniques in poultry production, processing, marketing and price discovery. Consumption trends, breeds and consumer grades. Laboratory application of management skills, health care, keeping of production and accounting records and processing techniques. 3 lectures, 1 laboratory.

**ASCI 226. Livestock Evaluation. 3 units**

Term Typically Offered: SP  
Utilization of objective and subjective estimation measures in establishing economic worth of domestic animals of the three meat animal species and horses. 1 lecture, 2 laboratories.

**ASCI 227. Companion Animal Science. 4 units**

Term Typically Offered: F  
Companion animal anatomy and physiology, reproduction, nutrition, behavior, management, common parasites, and infectious diseases. Scientific method in studying the human-animal bond. Application of biological concepts to problems related to companion animals. Trends in pet industry including animal welfare issues. 3 lectures, 1 laboratory.

**ASCI 228. Equine Evaluation. 2 units**

Term Typically Offered: W  
Appraisal of equine breeds at halter and in performance classes. Evaluate horse classes, decide their order of placement, and then orally justify these decisions to a judge. The relationship of equine anatomy and physiology on competitive performance. 2 laboratories.

**ASCI 229. Anatomy and Physiology of Farm Animals. 4 units**

Term Typically Offered: F, W, SP  
Prerequisite: BIO 111 or BIO 161.

Comprehensive overview of the principal systems of farm animals using an integrative, systemic approach to learning the homeostasis of mammalian organisms so the information can be applied to their daily care and management. 3 lectures, 1 laboratory.

**ASCI 232. General Animal Science Laboratory. 1 unit**

Term Typically Offered: W  
Basic handling skills of livestock; introductory selection of livestock; basic feedstuff identification and processing; and health care practices. 1 laboratory.

**ASCI 260. Preparation of Livestock for Shows and Sales. 3 units**

Term Typically Offered: F, SP  
Techniques, equipment and knowledge necessary in order to properly condition, groom, and present beef cattle or horses for evaluation and merchandising. 3 activities.

**ASCI 265. Equine Behavior and Training. 3 units**

Term Typically Offered: F  
Training of weanling and yearling horses at halter. Selection of proper attire for the handler and equipment for the horse. Application of safe, behavioral training techniques enabling the horse to accept handling, farrier and health care. 3 activities.

**ASCI 270. Selected Topics. 1-4 units**

Term Typically Offered: TBD  
Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

**ASCI 290. Animal Production and Management Enterprise. 1-5 units**

CR/NC  
Term Typically Offered: F, W, SP  
Prerequisite: Consent of instructor.

Beginning field experience in animal production systems. May include health, nutrition, reproduction, management, processing, budgeting, and/or marketing exercises. Total major credit for ASCI 290 limited to 6 units. Total credit for ASCI 290 limited to 10 units. Credit/No Credit grading only. 1-5 lectures.

**ASCI 304. Animal Genomics. 3 units**

Term Typically Offered: W, SP  
Prerequisite: BIO 302 or BIO 303 or BIO 351.

Application of genetic principles for domestic animal improvement. Improving animal performance and health through use of genetic markers and diagnostics, gene mapping, and related current technologies. 3 lectures.

**ASCI 310. Technical Veterinary Skills. 4 units**

Term Typically Offered: F, W, SP  
Prerequisite: ASCI 229.

Restraint and handling of animals, physical examination, necropsy procedure, basic wound management, applied pharmacology. Reproduction and herd health programs. 3 lectures, 1 laboratory.

**ASCI 311. Advanced Beef Cattle System Management. 4 units**

Term Typically Offered: W  
Prerequisite: ASCI 221.

Management principles for the sustainability of commercial beef cattle operations. Systems approach for goal setting, financial analysis, range management, breeding systems, nutrition, health programs, marketing, and production practices to enhance profitability of commercial cow-calf operations. 3 lectures, 1 laboratory.

**ASCI 312. Production Medicine. 3 units**

Term Typically Offered: SP  
Prerequisite: ASCI 221 or ASCI 223; ASCI 225 or ASCI 222; ASCI 224 or ASCI 227; and ASCI 229.

Basic disease concepts. Fundamentals of immunology and therapeutics. Disease prevention principles, infectious and non-infectious. Pre-harvest food safety and milk and meat quality assurance. Herd health management programs for production efficiency and product quality. 3 lectures.

**ASCI 315. Equine Biomechanics. 4 units**

Term Typically Offered: F  
Prerequisite: ASCI 224.

Anatomy and physiology of the equine hoof and limb. An understanding of the art and science of the farrier's work. Evaluation of proper hoof care, trimming, and shoeing. Foot and leg conformation as it relates to sound locomotion. 3 lectures, 1 activity.



**ASCI 320. Physiological Chemistry of Animals. 4 units**

Term Typically Offered: W, SP

Prerequisite: ASCI 229 and one of the following: CHEM 212, CHEM 216, CHEM 312, or CHEM 316.

Interactions between the biological and chemical reactions in livestock. Physiology explained at the organ, tissue and cellular level as it relates to the whole animal system. 4 lectures.

**ASCI 321. Zoonoses and Veterinary Public Health Concerns. 4 units**

Term Typically Offered: W

Prerequisite: BIO 111 or BIO 161.

Public health concerns including: animal and bird diseases which may be transmitted to people; pre-harvest food safety and handling concerns; and environmental public health hazards. 3 lectures, 1 activity.

**ASCI 324. Advanced Equine Evaluation. 2 units**

Term Typically Offered: SP

Prerequisite: ASCI 228.

Appraising the relative merit of individual horses in halter and performance through the application, development and refinement of deductive and inductive logical processes. Oral and written expression of the selection rationale. 2 laboratories.

**ASCI 325. Egg Production, Processing and Distribution. 4 units**

Term Typically Offered: SP

Prerequisite: ASCI 225.

Management of replacement pullets and laying hens including flock scheduling, vaccination and handling procedures, nutrition management, costs of operation and production projections. Quality determination, processing, sales and distribution of shell eggs and egg products. 3 lectures, 1 laboratory.

**ASCI 326. Advanced Livestock Evaluation. 2 units**

Term Typically Offered: F

Prerequisite: ASCI 112 and ASCI 226.

Application of deductive and inductive logical processes in appraising the relative merit of individual animals within a group sample. Oral expression of the selection rationale. Total credits limited to 4 units. 2 laboratories.

**ASCI 329. Principles of Range Management. 4 units**

Term Typically Offered: F, SP

Prerequisite: Junior standing.

Characteristics, history and multiple uses of rangeland. Principles of range plant physiology and ecology in relation to range condition, trend, utilization and improvement practices. Principles of proper grazing practices and nutrition of livestock. 3 lectures, 1 laboratory.

**ASCI 330. Poultry Meat Production and Processing. 4 units**

Term Typically Offered: W

Prerequisite: ASCI 225.

Modern production techniques for the poultry meat industry. Management of hatcheries, broiler and/or turkey meat production, processing and further processing. 3 lectures, 1 laboratory.

**ASCI 333. Equine Reproduction. 5 units**

Term Typically Offered: W

Prerequisite: ASCI 224.

Management of the breeding farm, breeding problems, diseases, study of estrus cycles, servicing the mare, handling stallions. Breeding systems, teasing, embryo transfer, ultrasound pregnancy diagnosis, new developments in breeding technology. 4 lectures, 1 laboratory.

**ASCI 339. Internship in Animal Science. 1-12 units**

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Consent of internship instructor.

Selected Animal Science students will spend up to 12 weeks with an approved agricultural firm engaged in production or related business. Time will be spent applying and developing production and managerial skills and abilities. One unit of credit may be allowed for each full week of completed and reported internship. Major credit limited to 6 units. Total credit limited to 12 units. Credit/No Credit grading only.

**ASCI 340. Animal Welfare and Ethics. 4 units**

Term Typically Offered: W

Prerequisite: BIO 111 or BIO 161; and Junior Standing.

Introduction to moral principles that have shaped the field of animal welfare science. Definition of Animal Welfare. Identification of science-based measures of welfare. Current welfare concerns with companion, laboratory, production, and exotic animals. 4 lectures.

**ASCI 342. Poultry Business Management. 4 units**

Term Typically Offered: W

Prerequisite: ASCI 225.

Organization and management of vertically integrated poultry operations. Personnel management, cash flow analysis, cash vs. accrual accounting, structuring of financial statements, projecting product outputs and cash flow needs, employee benefit programs and insurance needs for poultry companies. 4 lectures.

**ASCI 344. Equine and Human Communication. 3 units**

Term Typically Offered: F, W, SP

Prerequisite: ASCI 214.

Behavior of the horse and its relationship with people. Learning, motivation, social behavior and communication with techniques to improve the safety and understanding between people and horses. Total credit limited to 6 units. 3 activities.

**ASCI 345. Equine Behavior Modification. 5 units**

Term Typically Offered: W

Prerequisite: ASCI 344 and consent of instructor.

Advanced principles of equine behavior modification for training young horses under saddle. Identifying differences in individual horse's attitudes, techniques to teach horses to respond to different stimuli, management of young equine athlete. 5 activities.

**ASCI 346. Equine Nutrition. 4 units**

Term Typically Offered: SP

Prerequisite: ASCI 220 with a grade of C- or better or consent of instructor; and ASCI 224.

Equine digestion, diet development considerations and evaluations, nutritional management, and the relationship of respective topics to recommended feeding practices, research data, and nutritional portfolios. Information is based on recent advances in horse nutrition and the National Research Council's Nutrient Requirements for Horses. 3 lectures, 1 laboratory.

**ASCI 347. Equine Exercise Physiology. 3 units**

Term Typically Offered: SP

Prerequisite: ASCI 224.

Applied physiology of the exercising horse. Examine different physiological systems: muscular, cardiovascular, respiratory, and nutritional. Gait analysis, lameness, and treatment. The athletic horse: sports medicine, conditioning, drugs, and necropsy evaluation. A distance learning course. 3 lectures.

**ASCI 350. Nonruminant Nutrition. 4 units**

Term Typically Offered: W

Prerequisite: ASCI 220 with a grade of C- or better or consent of instructor.

Comparison of nonruminant and ruminant digestive systems, nutrient requirements, risk management for ingredients, formulation and nutritional management. Influence of growth and production curves, consumption patterns, and feeding management in commercial poultry and swine industries. Feed manufacturing and governmental regulations. 3 lectures, 1 laboratory.

**ASCI 351. Reproductive Physiology. 4 units**

Term Typically Offered: F, W, SP

Prerequisite: ASCI 229.

Reproductive anatomy of male and female farm animals. General endocrinology and systemic physiology. Endocrine system effects on the various aspects of reproduction, such as: gametogenesis, estrus, gestation, parturition, mothering and seasonality. Introduction to reproductive biotechnology and embryo manipulation. 3 lectures, 1 laboratory.

**ASCI 355. Ruminant Nutrition. 4 units**

Term Typically Offered: TBD

Prerequisite: ASCI 220 with a grade of C- or better or consent of instructor; and ASCI 320 or CHEM 313 or CHEM 371.

Digestive physiology and nutrition of ruminants. Anatomy and physiology of the digestive tract. Rumen microbial fermentation. Nitrogen utilization and metabolism. Energy partitioning. Net energy system. Range livestock and feedlot nutrition. Supplementation. Common metabolic and nutritional dysfunctions. Diet formulation. 3 lectures, 1 laboratory.

**ASCI 360. Holistic Management. 4 units**

GE Area F

Term Typically Offered: F, W, SP

Prerequisite: Junior standing and completion of GE Area B.

Application of holistic management, a goal-oriented, value-driven framework for making decisions that are ecologically, economically, and socially sound. Impact of technology and other tools on ecosystem processes. Holistic approach to management, especially of land-based resources, aimed toward greater biodiversity and sustainability. Not open to students with credit in AG 450. 3 lectures, 1 laboratory. Crosslisted as AG/ASCI 360. Fulfills GE Area F.

**ASCI 363. Undergraduate Seminar. 2 units**

Term Typically Offered: F, W, SP

Prerequisite: Junior standing.

Major developments in the chosen field of the student. Discussion of new developments, policies, practices, and procedures. Each individual is responsible for the development and presentation of a topic in the chosen field, resume, and cover letter. 2 seminars.

**ASCI 366. Veterinary Pharmacology. 4 units**

Term Typically Offered: W

Prerequisite: CHEM 111 or CHEM 127, and ASCI 229.

Investigation of pharmacological principles applied to animal systems. Overview of drugs acting on the nervous, endocrine, circulatory, urinary systems, and reproductive systems, specialty areas of pharmacology, and pharmacogenomics of livestock and companion animals. 3 lectures, 1 activity.

**ASCI 370. Rangeland Improvements. 3 units**

Term Typically Offered: W

Prerequisite: ASCI 329.

Review of practices used for improving the productivity or ecological functions of rangeland landscapes managed for grazing livestock, wildlife, or for ecological and/or aesthetic values. 3 lectures.

**ASCI 384. Processed Meat Products. 4 units**

Term Typically Offered: F

Prerequisite: ASCI 211 and junior standing.

Physical, chemical and functional characteristics of meat food raw materials. Science and technology of value-added processing including curing, sausage manufacture, low moisture products, and restructuring. Quality assurance and related current industry topics. 3 lectures, 1 laboratory.

**ASCI 400. Special Problems for Advanced Undergraduates. 1-4 units**

CR/NC

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 4 units per quarter. Credit/No Credit grading only.

**ASCI 403. Applied Biotechnology in Animal Science. 5 units**

Term Typically Offered: F

Prerequisite: BIO 161; BIO 162; and upper division genetics course (BIO 302 or BIO 303 or BIO 351 or ASCI 304).

Coverage of current resources, techniques and methodologies used in animal research and biotechnology as well as experimental design, model assessment, and data interpretation with application to an experimental setting in the laboratory. 3 lectures, 2 laboratories.

**ASCI 405. Domestic Livestock Endocrinology. 4 units**

Term Typically Offered: F

Prerequisite: ASCI 229 or BIO 361.

Endocrine homeostasis with emphasis on the influence of hormones involved in digestion, metabolism, calcium and phosphorous, thyroid gland, adrenal gland, reproduction, and pregnancy. Signaling pathways. 4 lectures.

**ASCI 406. Applied Animal Embryology and Assisted Reproduction. 4 units**

Term Typically Offered: TBD

Prerequisite: ASCI 229 and ASCI 351.

Comparative physiology and molecular understanding of oocyte development, fertilization, culturing, cryopreservation and micromanipulation of gametes and embryos. 3 lectures, 1 activity.

**ASCI 407. Assisted Reproduction Technologies of Gametes and Embryos Laboratory. 3 units**

Term Typically Offered: TBD

Prerequisite: ASCI 229; ASCI 351; and ASCI 406. Recommended: ASCI 320 or CHEM 371; CHEM 327.

Coverage of current resources, advanced techniques and methodologies of assisted reproduction of gametes and embryos involving in-vivo collection, in-vitro fertilization, cryopreservation and micromanipulation. Mouse, cattle and horse gametes used for learning the techniques involved in embryology and assisted reproduction 1 lecture, 2 laboratories.

**ASCI 410. Applied Animal Behavior Science. 4 units**

Term Typically Offered: SP

Prerequisite: BIO 111 or BIO 161; and ASCI 229 or BIO 162.

Principles of behavior applied to animals in managed environments. Observation and measurement of behavior, including sampling and recording methods. Learning, including training and operant conditioning. Discussion of issues related to behavioral welfare. Etiology and management of maladaptive behavior. 3 lectures, 1 laboratory.

**ASCI 412. Advanced Livestock Event Planning. 3 units**

Term Typically Offered: W

Prerequisite: ASCI 212, AGB 314 and consent of instructor.

Organization and planning for the Western Bonanza Junior Livestock Show. Establishment of committee assignments and show manager responsibilities. Corporate partnerships established and fund raising begun. Planning for activities and guest speakers and new student recruitment. Total credit limited to 6 units. 1 lecture, 2 activities.

**ASCI 413. Advanced Livestock Event Management. 1 unit**

Term Typically Offered: SP

Prerequisite: ASCI 412 and consent of instructor.

Student management of the Western Bonanza Junior Livestock Show. Leadership skills, team building, media relations, use of computer applications, livestock and fair industry contacts and mentoring to new students. Application of knowledge learned in ASCI 412. Total credit limited to 2 units. 1 activity.

**ASCI 415. HACCP for Meat and Poultry Operations. 3 units**

Term Typically Offered: W

Prerequisite: ASCI 211.

Using Hazard Analysis and Critical Control Point (HACCP) principles to develop regulatory inspection plans for meat and poultry operations; development and use of prerequisite programs; microbiological and process overviews. 3 lectures.

**ASCI 420. Animal Metabolism and Nutrition. 3 units**

Term Typically Offered: TBD

Prerequisite: ASCI 220 with a grade of C- or better or consent of instructor; and ASCI 320 or CHEM 313 or CHEM 371.

Metabolism of proteins, carbohydrates, lipids, minerals, vitamins and water, and the relationship of nutrient utilization to animal production. 3 lectures.

**ASCI 425. Meat Industry Study Tour. 2 units**

Term Typically Offered: W

Prerequisite: ASCI 211.

Study tour of commercial meat businesses. Livestock harvest and carcass fabrication, further meat processing, retail and food service operations. Personnel, processing procedures, regulatory standards, industry specifications and current issues. Travel for 4 days. 2 activities.

**ASCI 438. Systemic Animal Physiology. 4 units**

Term Typically Offered: F, SP

Prerequisite: ASCI 229; CHEM 313 or CHEM 371, or ASCI 320.

Homeostatic relationships of organ systems. Cardiovascular, respiratory, urogenital and neuro-endocrinological functions. 3 lectures, 1 laboratory.

**ASCI 440. Immunology and Diseases of Animals. 4 units**

Term Typically Offered: TBD

Prerequisite: ASCI 229. Recommended: ASCI 320, CHEM 371 or equivalent.

Introduction to immune system, including innate and acquired immunity of domesticated animals. Application of immunological analyses and examination of current disease issues in domesticated animals. 3 lectures, 1 laboratory.

**ASCI 450. Computer Applications in Animal Science: Spreadsheet Analysis. 4 units**

Term Typically Offered: TBD

Prerequisite: Junior standing.

Development of spreadsheets relating to livestock production. Integration of database and analytical techniques. Cost-benefit analyses of livestock production systems. 2 lectures, 2 activities.

**ASCI 455. Advanced Equine Reproductive Technologies. 4 units**

Term Typically Offered: TBD

Prerequisite: ASCI 333 and ASCI 351. Recommended: ASCI 405 and ASCI 406.

Assisted reproductive technologies in horses; use of gametes from normal and sub-fertile horses; manipulation of sub-fertile horses, donor and recipient mares; manipulation of endocrine system; embryo utilization; cryobiology of gametes and embryos; assessment of high-risk mare, fetus, and neonate. 3 lectures, 1 laboratory.

**ASCI 460. Rangeland Assessment and Planning. 4 units**

Term Typically Offered: TBD

Prerequisite: ASCI 329.

Examination of methods used for determining the healthy and function of rangeland ecosystems, and the application of planning processes used in the management of rangelands and associated ecosystems. Field trip required. 3 lectures, 1 laboratory.

**ASCI 470. Selected Advanced Topics. 1-4 units**

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1 to 4 lectures.

**ASCI 471. Selected Advanced Laboratory. 1-4 units**

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1 to 4 laboratories.

**ASCI 477. Senior Project - Research Experience in Animal Science. 3 units**

Term Typically Offered: F, W, SP

Prerequisite: Senior standing, ASCI 363 and consent of instructor.

Recommended: one course in statistics.

Independent research experience in a specific area of animal science conducted under faculty supervision. Satisfies senior project requirement. Minimum 90 hours required.

**ASCI 478. Senior Project - Advanced Internship Experience in Animal Science. 3 units**

Term Typically Offered: F, W, SP

Prerequisite: ASCI 363 and senior standing.

Independent internship experience conducted under faculty supervision focusing on a discipline area of animal science. Completion of a project as a component of the internship. Satisfies senior project requirement. Minimum 90 hours required.

**ASCI 479. Senior Project - Current Topics in Animal Science. 3 units**

Term Typically Offered: F, SP

Prerequisite: Senior standing and ASCI 363.

Critical evaluation and formal presentation of current issues facing animal agriculture. Evaluation of current topics, analysis of supporting evidence and logic, and synthesis and formal presentation of the resulting perspectives on different approaches to current challenges. 3 lectures.

**ASCI 490. Advanced Animal Production and Management Enterprise. 1-5 units**

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Consent of instructor.

Advanced field experience in animal production systems. May include health, nutrition, reproduction, management, processing, budgeting, and/or marketing exercises as well as management decision-making opportunities. Total major credit for ASCI 490 limited to 6 units. Total credit for ASCI 490 limited to 10 units. Credit/No Credit grading only. 1-5 lectures.

**ASCI 500. Individual Study in Animal Science. 1-6 units**

Term Typically Offered: F, W, SP

Prerequisite: Consent of department head, graduate advisor and supervising faculty member.

Advanced independent study planned and completed under the direction of a member of the Animal Science faculty. Total credit limited to 6 units.

**ASCI 503. Advanced Molecular Techniques in Animal Science. 4 units**

Term Typically Offered: TBD

Prerequisite: ASCI 403 or equivalent course.

Advanced molecular laboratory techniques in animal science. Topics include analyses of cellular and metabolic regulation, gene expression, gene activation and regulation, gene construct design, transgenesis, knockout animal models. 2 lectures, 2 laboratories.

**ASCI 520. Comparative Animal Nutrition. 4 units**

Term Typically Offered: TBD

Prerequisite: ASCI 320, or CHEM 313 or CHEM 371, and one of the following: ASCI 346, or ASCI 350, or ASCI 355, or DSCI 301, or consent of instructor.

Advanced problem-based presentation of animal nutrition case studies. Emphasis on nutrients, clinical nutrition disorders and species not commonly considered in production animal nutrition. Analytical and problem-solving skills will be utilized to develop solutions to complex animal nutrition management issues. 3 lectures, 1 activity.

**ASCI 540. Advanced Immunology and Diseases of Animals. 4 units**

Term Typically Offered: TBD

Prerequisite: ASCI 229; ASCI 320 or CHEM 371; STAT 218.

In-depth analysis of the immune system, including molecular basis for immunity of domesticated animals. Application of immunological assays, and application of scientific method to examine immunity and disease in domesticated animals. Not open to students with credit in ASCI 440. 3 lectures, 1 laboratory.

**ASCI 570. Selected Topics in Animal Science. 1-4 units**

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 12 units. 1 to 4 seminars.



**ASCI 571. Selected Advanced Laboratory. 1-4 units**

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 laboratories.

**ASCI 581. Graduate Seminar in Animal Science. 1-4 units**

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Graduate standing and consent of instructor.

Current findings and research problems in the field and their application to the industry. Credit/No Credit grading only. Total credit limited to 12 units. 1-4 seminars.

**ASCI 593. Regenerative Medicine Internship. 3-5 units**

Term Typically Offered: TBD

Prerequisite: Graduate standing in the Specialization in Regenerative Medicine for the MS in Biological Sciences; or the Specialization in Regenerative Medicine for the MS in Biomedical Engineering; or the Specialization in Animal Science for the MS in Agriculture.

Supervised graduate research and/or development in stem cell science or regenerative medicine and engineering. Provides students with an off-campus industrial or university internship. Total credit limited to 10 units. Crosslisted as ASCI/BIO/BMED 593.

**ASCI 594. Applications in Regenerative Medicine. 2 units**

Term Typically Offered: TBD

Prerequisite: Graduate standing in the Specialization in Regenerative Medicine for the MS in Biological Sciences, or the MS in Biomedical Engineering, or the Animal Science Specialization in the MS in Agriculture.

Transfer of skills and knowledge gained through coursework, in an applied setting at Cal Poly. Demonstration of technical, problem solving, and presentation skills, and familiarity with current research. Part of the culminating experience for the Specialization in Regenerative Medicine in the MS in Biological Sciences, or the MS in Biomedical Engineering, or the Animal Science Specialization in the MS in Agriculture. 1 seminar and supervised work. Crosslisted as ASCI/BIO/BMED 594.

**DSCI Courses****DSCI 100. Enterprise Project. 1-4 units**

CR/NC

Term Typically Offered: TBD

Selection and completion of a management/production project under faculty supervision. Project participation is subject to approval by the project supervisor and the Cal Poly Corporation. Degree credit limited to 12 units. Credit/No Credit grading only.

**DSCI 102. Dairy Operations and Safety. 2 units**

Term Typically Offered: SP

Dairy farm biosecurity, animal handling and welfare, equipment operation, employee safety and hazard analysis. Instruction in standard operating procedures (SOP) relevant to milking, transition cow and calf management and cattle identification. 2 activities.

**DSCI 200. Special Problems for Undergraduates. 1-2 units**

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

**DSCI 202. Dairy Promotion and Marketing. 4 units**

Term Typically Offered: F

Prerequisite: DSCI 230 and DSCI 231.

National and state dairy promotional programs, advertising and merchandising. Marketing and pricing of milk and dairy products at the state and national level. 4 lectures.

**DSCI 230. General Dairy Husbandry. 4 units**

Term Typically Offered: F, W, SP

Selection, breeding, feeding, and management of dairy cattle.

Composition and food value of dairy products. Milk pricing, political influences, dairy industry statistics and opportunities. Producing and handling products. Intended as introductory course for non-dairy science majors. 3 lectures, 1 laboratory.

**DSCI 231. General Dairy Manufacturing. 4 units**

Term Typically Offered: F, SP

Composition and properties of fluid milk and manufactured milk products. Chemistry and microbiology of dairy products. Processes and equipment involved in the manufacture of butter, cheeses, and other fermented dairy products, frozen, condensed, and dried dairy foods. 3 lectures, 1 activity.

**DSCI 233. Milk Processing and Inspection. 4 units**

Term Typically Offered: W

Prerequisite: DSCI 231, or FSN 125, or FSN 230.

Composition and properties of fluid milk and its constituents. Equipment used to handle, process, and distribute fluid milk and related products. California dairy codes used for dairy farms and plants, with practice inspections of dairy farms and factories. 3 lectures, 1 laboratory.

**DSCI 241. Dairy Cattle Selection, Breeds, Fitting and Showing. 4 units**

Term Typically Offered: SP

Prerequisite: DSCI 230.

Selection of dairy cattle on type conformation and the correlation between type and production. Dairy cattle breeds and breed comparisons. Techniques to properly condition, groom and present dairy cattle for evaluation and merchandising. 2 lectures, 2 activities.

**DSCI 270. Selected Topics. 1-4 units**

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

**DSCI 301. Dairy Cattle Nutrition. 4 units**

Term Typically Offered: F, SP  
Prerequisite: ASCI 220.

Nutrition principles to maximize milk production. Ruminal and post ruminal digestion, post absorptive metabolism, nutrient interactions and microbiology. Modern techniques to manipulate and increase animal efficiency. Use of computer models to evaluate and precisely formulate diets. 3 lectures, 1 activity.

**DSCI 321. Lactation Physiology. 4 units**

Term Typically Offered: F  
Prerequisite: ASCI 220; DSCI 230; and BIO 111 or BIO 161.

Mechanisms of milk component secretion, including protein, lactose and fat metabolism. Disorders of the mammary gland (mastitis) and control strategies. Endocrine aspects of mammary gland development and lactogenesis. 4 lectures.

**DSCI 330. Artificial Insemination and Embryo Biotechnology. 4 units**

Term Typically Offered: F  
Prerequisite: ASCI 229 or DSCI 230.

Techniques in the collection, evaluation and processing of semen, along with embryo culturing and manipulation. Insemination procedures, fertility problems, record keeping, estrous synchronization, endocrine control of reproduction, treating reproductive disorders and embryo transfer. 3 lectures, 1 laboratory.

**DSCI 333. Dairy Animal Health, Safety and Applied Technology. 4 units**

Term Typically Offered: W  
Prerequisite: ASCI 220 and DSCI 230.

Application of principles of herd health, biosecurity, lactation physiology, cattle management and reproductive physiology to successful dairy operations. Assessment of animal comfort and general health and well-being. Practical techniques in safe animal handling. 3 lectures, 1 activity.

**DSCI 339. Internship in Dairy Science. 1-12 units**

CR/NC  
Term Typically Offered: TBD  
Prerequisite: Consent of internship instructor.

Selected Dairy Science students will spend up to 12 weeks with an approved agricultural firm engaged in production or related business. Time will be spent applying and developing production and managerial skills and abilities. One unit of credit may be allowed for each full week of completed and reported internship. Degree credit limited to 12 units. Credit/No Credit grading only.

**DSCI 340. Dairy Waste Management and Resource Recovery. 3 units**

Term Typically Offered: TBD  
Prerequisite: MCRO 221.

Management of dairy wastes to protect the environment while providing a return on investment. Selection of waste management systems, considering capital and operating costs and benefits from nutrient, biogas, and heat recovery. Best practices that meet current regulatory requirements. 3 lectures.

**DSCI 400. Special Problems for Advanced Undergraduates. 1-2 units**

Term Typically Offered: TBD  
Prerequisite: Consent of instructor.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

**DSCI 401. Physical and Chemical Properties of Dairy Products. 4 units**

Term Typically Offered: SP  
Prerequisite: Junior standing. Recommended: CHEM 312.

Composition, structure and properties of milk and milk products. Physical and chemical changes that occur during processing and storage of dairy products. Objective measurement of chemical and physical properties. 3 lectures, 1 laboratory.

**DSCI 402. Quality Assurance and Control of Dairy Products. 4 units**

Term Typically Offered: F  
Prerequisite: DSCI 444 or MCRO 421.

Current methods used to evaluate dairy products with respect to plant economics and consumer safety. Accurate procedures for chemical and biological testing, statistical approach to sampling and design and interpretation of HACCP programs for assuring product quality and safety. 3 lectures, 1 laboratory.

**DSCI 410. Advanced Dairy Nutrition. 4 units**

Term Typically Offered: F  
Prerequisite: ASCI 229; and ASCI 355 or DSCI 301.

Nutrient metabolism and diet formulation technologies for all classes of dairy cattle; whole-farm feed management; physiological and nutritional aspects of predominant metabolic disorders; on-farm auditing and troubleshooting of nutritional management. Field trip required. 3 lectures, 1 laboratory.

**DSCI 412. Dairy Farm Consultation. 4 units**

Term Typically Offered: W  
Prerequisite: DSCI 333.

Student consultation teams of three or four students visit dairies and/or attend management training seminars followed by presenting management recommendations to the dairy owners, consultants, and other industry leaders. 1 seminar and supervised work.

**DSCI 422. Breeding and Genetics of Dairy Cattle. 4 units**

Term Typically Offered: SP  
Prerequisite: DSCI 241, BIO 111 or higher, STAT 130 or higher.

Evaluation of inherited characteristics in dairy cattle, including principles of inheritance and genomic evaluations. Proving and selecting sires and dams, dairy genetic evaluations. 4 lectures.

**DSCI 432. Advanced Dairy Herd Management. 4 units**

Term Typically Offered: W  
Prerequisite: DSCI 333.

Dairy herd management skills needed in dairy operations. Instruction and lab experience in management, records, labor, waste management, and milking management. 4 lectures.

**DSCI 433. Dairy Plant Management and Equipment. 4 units**

Term Typically Offered: F  
Prerequisite: DSCI 233 or FSN 204.

Basic management principles applied to the dairy industry. Industrial organization and control. Dairy plant design, facilities, layout. Inventory control and records. Milk pooling and stabilization records. Maintenance and operation of equipment. 3 lectures, 1 laboratory.

**DSCI 434. Cheese and Fermented Dairy Foods. 4 units**

Term Typically Offered: W  
Prerequisite: DSCI 231; MCRO 221 or MCRO 224; and STAT 218.  
Recommended: CHEM 313.

Scientific methods, ingredients, and equipment used in the manufacture of various fermented dairy products, including cheeses, buttermilk, sour cream, and yogurt. 3 lectures, 1 laboratory.

**DSCI 435. Concentration and Fractionation Technology. 4 units**

Term Typically Offered: SP  
Prerequisite: DSCI 233 or FSN 204.

Technology of evaporation, drying and membrane separation processes applied to dairy fluids. Design and performance of evaporators, driers, and membrane processing systems. Equipment, ingredients, and methods needed to manufacture butter and dairy spreads. 3 lectures, 1 laboratory.

**DSCI 444. Dairy Microbiology. 4 units**

Term Typically Offered: TBD  
Prerequisite: DSCI 233; and MCRO 221 or MCRO 224; and STAT 130 or STAT 218; or graduate standing.

Microorganisms involved in the fermentation and ripening processes in the dairy industry, as well as those involved in spoilage of milk and dairy products, in the transmission of disease through these products, and indicator systems used to determine sanitary quality of these products. 3 lectures, 1 laboratory.

**DSCI 461. Senior Project. 3 units**

Term Typically Offered: TBD  
Prerequisite: Junior standing.

Selection and completion of a project under faculty supervision. Projects are typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal written report. 2 lectures and supervised work.

**DSCI 470. Selected Advanced Topics. 1-4 units**

Term Typically Offered: TBD  
Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1 to 4 lectures.

**DSCI 471. Selected Advanced Laboratory. 1-4 units**

Term Typically Offered: TBD  
Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 laboratories.

**DSCI 500. Individual Study in Dairy Science. 1-6 units**

Term Typically Offered: TBD  
Prerequisite: Consent of department head, graduate advisor and supervising faculty member.

Advanced independent study planned and completed under the direction of a member of the Dairy Science faculty. Total credit limited to 6 units.

**DSCI 501. Dairy Chemistry. 3 units**

Term Typically Offered: F  
Prerequisite: CHEM 212 or CHEM 312; admission to Master of Professional Studies program in Dairy Products Technology.  
Recommended: Differential and Integral Calculus.

Composition, structure/functional relationships and properties of milk, milk components and products. Physical, chemical and biochemical changes that occur during processing, storage and use of milk and milk components. Chemical, physical, functional and nutritional properties of milk components. 3 lectures.

**DSCI 502. Dairy Chemistry Laboratory. 2 units**

Term Typically Offered: W  
Prerequisite: DSCI 501; admission to Master of Professional Studies program in Dairy Products Technology.

Objective measurements, analysis and isolation of milk components. Experimental demonstration of chemical and physical reactions of milk components during typical processing conditions. 2 laboratories.

**DSCI 510. Dairy Foods: Issues and Practices. 2 units**

Term Typically Offered: F  
Prerequisite: Admission to Master of Professional Studies program in Dairy Products Technology.

Contemporary issues in the dairy foods and allied industries. Consumer, political, environmental, regulatory, producer, technological, scientific, and economic considerations critical to future industry leaders. Required field trips to the dairy foods processing industry in California. 1 lecture, 1 activity.

**DSCI 520. Dairy Processing and Manufacturing I. 3 units**

Term Typically Offered: F  
Prerequisite: Admission to Master of Professional Studies program in Dairy Products Technology. Concurrent: DSCI 540.

Principles of unit operations involving heat and mass transfer including pasteurization and related thermal processes, centrifugal separation, concentration processes, churning and related high shear extrusion, fractionation processes, freezing, and drying technologies. Pneumatic and mechanical devices and systems. 2 lectures, 1 laboratory.

**DSCI 521. Dairy Processing and Manufacturing II. 4 units**

Term Typically Offered: W  
Prerequisite: DSCI 520; admission to Master of Professional Studies program in Dairy Products Technology.

Unit operations in process systems for the efficient manufacture of fluid milk products, cream, butter, and concentrated milk. Process variables and their control, system integration. Use of processes to manipulate physical and chemical properties to influence product quality. 3 lectures, 1 laboratory.

**DSCI 524. Dairy Processing and Manufacturing III. 4 units**

Term Typically Offered: SP

Prerequisite: DSCI 520.

Unit operations in process systems for the efficient manufacture of fermented milks, cheese, frozen desserts, and dried milk and whey products. Process variables and their control, system integration for these products. 3 lectures, 1 laboratory.

**DSCI 535. Dairy Foods Ingredient Functionality. 4 units**

Term Typically Offered: SP

Prerequisite: DSCI 501.

Identification and industrial use of functional milk fractions. Physical, chemical, and sensory properties of milk fractions. Objective and sensory measurements of milk ingredients as used in food and beverage products. 3 lectures, 1 laboratory.

**DSCI 539. Graduate Internship in Dairy Science. 1-9 units**

Term Typically Offered: SU

Prerequisite: Consent of internship instructor.

Application of theory to the solution of problems of agricultural production or related business in the field of Dairy Science. Analyze specific management problems and perform general management assignments detailed in a contract between the student, the firm or organization, and the faculty advisor before the internship commences. Degree credit limited to 6 units.

**DSCI 540. Graduate Dairy Microbiology. 4 units**

Term Typically Offered: F

Prerequisite: Admission to Master of Professional Studies program in Dairy Products Technology. Concurrent: DSCI 520. Recommended: MCRO 221 or equivalent.

Raw milk microbiological principles, pasteurization and microorganisms in dairy foods safety, microbiological analysis of dairy products, fermented milks and cheese, starters and probiotics, commercial practices and sources of information for regulation on microbial aspects of dairy foods. 2 lectures, 2 laboratories.

**DSCI 541. Quality Assurance, Quality Control and Food Safety. 4 units**

Term Typically Offered: W

Prerequisite: Admission to Master of Professional Studies program in Dairy Products Technology.

Concepts and methodologies used in dairy industry and dairy food plants for assurance and control of the quality of finished product. Basis for understanding physical, chemical and microbiological methods as they apply to quality evaluation of dairy foods. 3 lectures, 1 laboratory.

**DSCI 560. Recent Developments in Dairy Science and Technology. 1-3 units**

Term Typically Offered: TBD

Prerequisite: Senior or graduate standing and approval of instructor.

Presentation and critical review of current research publications. Methodological advances and applications in dairy food systems. Class Schedule will list topic selected. Total credit limited to 6 units. 1-3 seminars.

**DSCI 565. Industrial Plant Considerations for Sustainable Operation. 4 units**

Term Typically Offered: SP

Prerequisite: DSCI 520; admission to Master of Professional Studies program in Dairy Science Technology.

Plant site selection considerations, project management, plant design and layout, management of productivity maintenance, plant improvement project selection criteria, working with regulatory environment, community relations, and personal safety for overall industrial plant sustainability. 3 lectures, 1 activity.

**DSCI 570. Selected Topics in Dairy Science. 1-4 units**

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 12 units. 1 to 4 seminars.

**DSCI 571. Selected Advanced Laboratory in Dairy Science. 1-4 units**

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1-4 laboratories.

**DSCI 581. Graduate Seminar in Dairy Science. 1-3 units**

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Graduate standing or consent of instructor.

Current findings and research problems in the field and their application to industry. Group study of current problems of industry. Current experimental and research findings as applied to production and marketing. Repeatable for up to 3 units. Credit/No Credit grading only. 1-3 seminars. Credit/ no credit grading only.

**DSCI 582. Dairy Processing and Plant Management. 2 units**

Term Typically Offered: SP

Prerequisite: Admission to Master of Professional Studies program in Dairy Products Technology.

Dairy plant operation, processing experience and production team dynamics. Practical training and experience in dairy plant operations to allow efficient, safe and sanitary processing of dairy products manufacture in a team environment. Total credit limited to 4 units. 2 laboratories.

**DSCI 585. Cooperative Education Experience in Dairy Science. 1-6 units**

CR/NC

Term Typically Offered: TBD

Prerequisite: Graduate standing and consent of instructor.

Advanced study, analysis and part-time work experience in the field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Total credit limited to 9 units. Credit/No Credit grading only.

**DSCI 599. Thesis in Dairy Science. 1-9 units**

Term Typically Offered: TBD

Prerequisite: Graduate standing and consent of instructor.

Systematic research of a significant problem in Dairy Science. Thesis will include problem identification, significance, methods, data analysis, and conclusion. Students must enroll every quarter in which facilities are used or advisement is received. Degree credit limited to 6 units.