Animal Physiology

See Animal Biology, on page 150; Animal Science, on page 153; Neurobiology, Physiology, and Behavior, on page 443; Philosophy, on page 460; and Molecular, Cellular, and Integrative Physiology (A Graduate Group), on page 433.

Animal Science

Department Office, 2232 Meyer Hall 530-752-1250; http://animalscience.ucdavis.edu/

Graduate Advising. 1249 Meyer Hall 530-754-7915; Academic Senate Distinguished Teaching Award

C. Christopher Calvert, Ph.D., Professor, Undergraduate Advising.

Master Adviser. E.J. DePeters

Undergraduate Advising. 1202 Meyer Hall 530-754-7913; Academic Senate Distinguished Teaching Award

Advancing Center for the major, minors and course offerings (including peer advising) is located in the Animal Science Advising Center in 1202 Meyer Hall 530-754-7915. Each student will be assigned a faculty adviser through this office upon entering the major.

Graduate Advising. 1249 Meyer Hall 530-752-2382

Faculty

Trih J. Berger. Ph.D., Professor

C. Christopher Calvert, Ph.D., Professor

Academic Senate Distinguished Teaching Award

Ernest S. Chang, Ph.D., Professor

(Engineering Sciences and Mathematics)

Mary E. Delany, Ph.D., Professor and Associate Dean in CAS

Edward J. DePeters, Ph.D., Professor

Academic Senate Distinguished Teaching Award

UC Davis Prize for Undergraduate Teaching and Scholarly Achievement

Sergei Doroshov, Ph.D., Professor

John M. Eadie, Ph.D., Professor Emeritus

(Wildlife, Fish & Conservation Biology; Animal Science)

James G. Fadel, Ph.D., Professor

Thorsten R. Fauth, Ph.D., Professor

Academic Senate Distinguished Teaching Award

Russell C. Hovey, Ph.D., Professor

Silas S. Hogue, Ph.D., Professor

Ermias Kebreab, Ph.D., Professor

Annie J. King, Ph.D., Professor

Kirk C. Klasing, Ph.D., Professor

Dietmar Kuehlz, Ph.D., Professor

Juan F. Medrano, Ph.D., Professor

Joy A. Mench, Ph.D., Vice Chairperson, Professor

Michael R. Miller, Ph.D., Assistant Professor

Frank M. Mitloehner, Ph.D., Professor and Specialist in Cooperative Extension

James D. Murray, Ph.D., Professor

Anita M. Oberbauer, Ph.D., Professor

Academic Senate Distinguished Teaching Award

Janet F. Roser, Ph.D., Professor

Pablo J. Ross, Ph.D., Assistant Professor

Barry W. Wilson, Ph.D., Professor

Huijien Zhou, Ph.D., Associate Professor

Richard A. Zinn, Ph.D., Professor

Emeriti Faculty

Hans Abplanalp, Ph.D., Professor Emeritus

Thomas E. Adams, Ph.D., Professor Emeritus

Academic Senate Distinguished Teaching Award

Gary B. Anderson, Ph.D., Distinguished Professor Emeritus, Distinguished Teaching Award; Graduate/Professional, UC Davis Prize for Undergraduate Teaching and Scholarly Achievement, Academic Senate Distinguished Teaching Award

C. Robert Ashmun, Ph.D., Professor Emeritus

Wallis H. Clark, Jr., Ph.D., Professor Emeritus

Douglas E. Conkin, Ph.D., Professor Emeritus

Graham A. E. Doll, Ph.D., Professor Emeritus

William N. Garrett, Ph.D., Professor Emeritus

Yu-Bang Lee, Ph.D., Professor Emeritus

James R. Millam, Ph.D., Professor Emeritus

Edward O. Price, Ph.D., Emeritus Professor

Kathryn Rakie, Ph.D., Professor Emeritus

Wesley W. Weathers, Ph.D., Professor Emeritus

Barry W. Wilson, Ph.D., Professor Emeritus

Affiliated Faculty

Fred S. Conte, Ph.D., Specialist in Cooperative Extension and Lecturer

Joshua Hull, Ph.D., Assistant Adjunct Professor

Elizabeth A. Van Eemeren, Ph.D., Lecturer and Adviser

Bernard P. May, Ph.D., Adjunct Professor

Deanne Meyer, Ph.D., Specialist in Cooperative Extension and Lecturer

James W. Olijen, Ph.D., Specialist in Cooperative Extension and Lecturer

Peter H. Robinson, Ph.D., Specialist in Cooperative Extension and Lecturer

Alison L. Van Eemeren, Ph.D., Specialist in Cooperative Extension and Lecturer

Dana B. Van Liew, M.E., Continuing Lecturer

Academic Federation Excellence in Teaching Award

The Major Program

The Animal Science major is devoted to the sciences central to understanding biological function of domestic and captive animals, their care, management, and utilization by people for food, fiber, companionship and recreation. Advances in science and technology, and an ever-expanding human population, have increased the complexity of issues surrounding the care and management of animals. Specializations within the major allow students to develop a scientific appreciation of animals and their relationship to their environment. Graduates in Animal Science are able to advance the science and technology of animal care and management in an objective and effective manner for the betterment of animals and society.

The Program. The curriculum provides depth in the biological and physiological sciences and allows students to specialize within the broad field of applied animal science. Study begins with introductory courses in animal science, biology, chemistry, mathematics, and statistics. Students undertake advanced courses in animal behavior, biochemistry, genetics, nutrition, and physiology and the integration of these sciences to animal function, growth, reproduction, and lactation. Students complete the curriculum by choosing a specialization in either an animal science discipline (behavior, biochemistry, genetics, nutrition, or physiology) or in the sciences particular to a class of animals (aquatic, avian, companion and captive, equine, laboratory, livestock and dairy, or poultry). Career Alternatives. A wide range of career opportunities are available to graduates. The primary goal of the major is to prepare students for graduate study leading to the M.S. and Ph.D. degrees; for continued study in a professional school such as veterinary medicine, human medicine or dentistry; for careers in research, agricultural production, farm and ranch management, or positions in business, sales, financial services, health care, agricultural extension, consulting services, teaching, journalism, or laboratory technology.

B.S. Major Requirements:

<table>
<thead>
<tr>
<th>Units</th>
<th>Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>53-57</td>
<td>Animal Science 1, 2, 41, 41L</td>
</tr>
<tr>
<td>12</td>
<td>Biological Sciences 2A, 2B, 2C</td>
</tr>
<tr>
<td>16-18</td>
<td>Mathematics 10A, 10B, 10C, 10D, 11A, 11B, 11C, 11D</td>
</tr>
<tr>
<td>6-8</td>
<td>Plant Sciences 120 or Statistics 100</td>
</tr>
</tbody>
</table>

Note: Some professional and graduate schools may require additional preparatory subject material. Please consult the advising center.
Laboratory Animal Science ........................... 23
Animal Science 42, 103, 140, Nutrition 121, 123, 123L, 140, 140T, Neurobiology, Physiology, and Behavior 102, and Anatomy, Physiology and Cellular Biology 100 or Neurobiology, Physiology, and Behavior 123.

Livestock and Dairy Science ............................. 20
Select two of Animal Science 143, 144, 146; Animal Science 145 or 147; Nutrition 115, 115T.

Select additional upper division units from any Animal Genetics, Animal Science or Avian Science courses, or from Nutrition 122, 123, 123L or other courses approved by your faculty adviser.

Poultry ..................................................... 20
Avian Sciences 11, 100, 150; Animal Science 143, Avian Sciences 149 or Food Science and Technology 121; Nutrition 123, 123L.

Select additional upper division units from any Animal Genetics, Avian Sciences, or other courses approved by your faculty adviser.

Students in this specialization must substitute Avian Sciences 103, 121, and Neurobiology, Physiology, and Behavior 117 for the Animal Science 124 and Neurobiology, Physiology, and Behavior 123 and 123L requirements.

Total Units for the Major ................................ 112-125

Minor Program Requirements:
The Department of Animal Science offers five minor programs open to students majoring in other disciplines who wish to complement their study programs with a minor in Animal Science. Some courses have prerequisites not included as part of the minor, and students should plan accordingly.

UNITS
Animal Science—Animal Biology .......................... 20
Animal Science 15, 42, 41 and 41L, or 41 and 21 ................................................. 3-4
Animal Science 103 or 104 ........................................... 3-4
Animal Science 123, 124, or Neurobiology, Physiology, and Behavior 121 and 121L ........................................... 3-4

Additional upper division courses ......................... 8-10
Select additional units to complete the 20-unit total from: upper division Animal Science courses, Animal Genetics courses, Neurobiology, Physiology, and Behavior 121, 121L, Nutrition 115, 122, 123, 123L.

Variable unit courses (92, 99, 192, 197T, 198, 199) are not allowed for the completion of this requirement.

Animal Science—Animal Genetics .......................... 20
Animal Science 15, 42, 41 and 41L, or 41 and 21 ................................................. 3-4
Animal Genetics 107, 111 ........................................... 9

Additional upper division courses .......................... 7-8
Select additional units to complete the 20-unit total from: upper division Animal Science courses, Animal Genetics courses, Avian Sciences 103, Neurobiology, Physiology, and Behavior 121, 121L, Nutrition 115, 122, 123, 123L.

Variable unit courses (92, 99, 192, 197T, 198, 199) are not allowed for the completion of this requirement.

Animal Science—Aquaculture .............................. 20
Animal Science 18 ........................................... 4
Animal Science 118, 119 ........................................... 4-8

Additional upper division courses .......................... 8
Select additional units to complete the 20-unit total from: upper division Animal Science courses, Animal Genetics courses, Applied Biological Systems Technology 161, Nutrition 124, Wildlife, and Conservation Biology 121.

Variable unit courses (92, 99, 192, 197T, 198, 199) are not allowed for the completion of this requirement.

Animal Science—Dairy/Livestock .......................... 20
Animal Science 41 and 41L or 21 ........................................... 4
Animal Science 104 ........................................... 4

Additional upper division courses .......................... 12
Select four or eight units from Animal Science 143, 144, 146.

Select additional units to complete the 20-unit total from: upper division Animal Science courses, Animal Genetics courses, Neurobiology, Physiology, and Behavior 121, 121L, Nutrition 115, 122, 123, 123L.

Variable unit courses (92, 99, 192, 197T, 198, 199) are not allowed for the completion of this requirement.

Animal Science—Equine ...................................... 21
Animal Science 15 ........................................... 3
Animal Science 104 ........................................... 3
Animal Science 115, 141 ........................................... 8
Animal Science 125 or 126 ........................................... 3

One additional upper division course .................... 2-3
Select from upper division Animal Science courses, Animal Genetics courses, Neurobiology, Physiology, and Behavior 121, 121L, Nutrition 115, 122, 123, 123L.

Variable unit courses (92, 99, 192, 197T, 198, 199) are not allowed for the completion of this requirement.

Minor Adviser: E.J. DePeters

Graduate Study. The Animal Biology Graduate Group offers a program of study and research leading to the M.S. or Ph.D. degree in Animal Biology. See Animal Biology (A Graduate Group), on page 151; see also Graduate Studies, on page 151.

Courses in Animal Science (ANS)

Lower Division
1. Domestic Animals and People (4)
Lecture—3 hours; laboratory—3 hours. Animal domestication and factors affecting their characteristics and distribution. Animal use for food, fiber, work, drugs, research and recreation; present and future roles in society. Laboratory exercises with beef and dairy cattle, poultry, sheep, swine, laboratory animals, fish, horses, meat and dairy products. GE credit: SciEng, Writ | SE, WE—II. (I.) Fumula

2. Introductory Animal Science (4)
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 1 or Biological Sciences 1A or 1B. Growth, reproduction, lactation, inheritance, nutrition, and disease control in domesticated animals and species used in biology; the application of sciences to animal production. GE credit: SciEng, Writ | SE, SL, VL, WE—III. (III.) Murray

12. Animal Science: Basic Principles and Application (3)
Lecture—3 hours. Overview of domestic and global animal industries. Exploration of production systems, animal biology, genetics, anatomy, physiology, reproduction, health, behavior, research, biotechnolgy and wellness. SciEng, Writ | SE—IV. (IV.) Oster

15. Introductory Horse Husbandry (3)
Lecture—3 hours. Prerequisite: course 2 recommended. Introduction to care and use of light horses emphasizing the basic principles for selection of horses, responsible ownership, proper nutrition, and use of feeding and raising of feeds. GE credit: SciEng | QL, SL, VL—II. (II.) Roser

17. Canine Behavior: Learning and Cognition (3)
Lecture—3 hours. Domestic dog behavior from basic principles of learning to complex cognitive behaviors; interaction between learning and cognition including how these processes contribute to interactions with humans. GE credit: SciEng | QL, SL, VL—II. (II.) Roser

18. Introductory Aquaculture (4)
Lecture—3 hours; discussion—1 hour. Historical and contemporary aquacultural principles. Interaction between the environment and the biology of aquatic animals. Impact of economic and governmental policies on the development of aquaculture. Interaction of aquacultural practices with larger societal goals. GE credit: SciEng | SE, OL, GL, VL—II. (II.) Kozel

21. Livestock and Dairy Cattle Judging (2)
Laboratory—6 hours. Prerequisite: course 1 or 2 recommended. Evaluation of type as presently applied to light horses, meat animals and dairy cattle. Relationship between form and function, form and carcass quality, and form and milk production. GE credit: SciEng | OL, SE—III. (III.) Van Liew

22A. Animal Evaluation (2)
Laboratory—3 hours; fieldwork—30 hours (total). Prerequisite: course 21 or the equivalent. Attendance at 3 one-day weekend field trips required. Domestic livestock species with emphasis on visual appraisal, carcass evaluation, and application of performance information. Emphasis on accurate written and oral descriptions of evaluations. Prerequisite to intercollegiate judging competition. Offered in alternate years. (P/NP grading only.) GE credit: OL, SE—II. (II.) Van Liew

22B. Animal Evaluation (2)
Laboratory—3 hours; fieldwork—30 hours (total). Prerequisite: course 22A or the equivalent. Attendance at 3 one-day weekend field trips required. Continuation of course 22A with emphasis on specific species: swine, beef cattle and sheep. Application of animal science principles to selection and management problem-solving scenarios. Prerequisite to intercollegiate judging competition. Offered in alternate years. (P/NP grading only.) GE credit: OL, SE—II. (II.) Van Liew

41. Domestic Animal Production (2)
Lecture—2 hours. Principles of farm animal management, including dairy and beef cattle, sheep, and swine. Industry trends, care and management, nutrition, and reproduction. GE credit: SciEng | SE—II. (II.) Metzler

41L. Domestic Animal Production Laboratory (2)
Discussion—1 hour; laboratory—3 hours. Prerequisite: course 41 (may be taken concurrently). Animal production principles and practices, including five field trips to dairy cattle, beef cattle, sheep, and swine operations and campus labs. (P/NP grading only.) GE credit: QL, SE, SL, VL, WE—II, I, (I, II) Metzler, Van Liew

42. Introductory Companion Animal Biology (4)

49A-K. Animal Management Practices (2)
Discussion—1 hour; laboratory—3 hours. The application of the principles of elementary biology to the management of a specific animal species. Among the topics offered: (A) Aquaculture, (B) Beef, (C) Dairy, (D) Goats, (E) Horses, (F) Laboratory Animals, (G) Meats, (H) Poultry, (I) Sheep, (J) Swine, (K) Captive and Companion Avian. Up to four different topics may be taken. (P/NP grading only.)—I, II, III. (I, II, III.)

90C. Research Group Conference (1)
Discussion—1 hour. Prerequisite: lower division standing, consent for instructor. Weekly conference on research problems, progress and techniques in the animal sciences. May be repeated for credit. (P/NP grading only.)—I, II, III. (I, II, III.)

90D. Internship in Animal Science (1-12)
Internship—3-18 hours. Prerequisite: consent of instructor. Internship off and on campus in dairy, live stock, and aquaculture production, research and management; or in a business, industry, or agency associated with these or other animal enterprises. All requirements of Internship Approval form must be met. (P/NP grading only.)—I, II, III. (I, II, III.)
98. Directed Group Study (1-5)
Prerequisite: consent of instructor. P/NP grading only.

99. Special Study for Undergraduates (1-5)
Prerequisite: consent of instructor. P/NP grading only.

Upper Division

103. Animal Welfare (4)
Lecture—2 hours; discussion—2 hours. Prerequisite: course 104 or Neurobiology, Physiology, and Behavior 101 or the equivalent or consent of instructor. The application of principles of animal behavior and physiology to assessment and improvement of the welfare of wild, captive, and domestic animals. Topics include animal pain, stress, cognition, motivation, emotions, and preferences, as well as environmental enrichment methods. GE credit: SciEng | SE, SL—I. (I.) Merch

104. Principles and Applications of Domestic Animal Behavior (4)
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or Biological Sciences 28. Basic principles of animal behavior as applied to domesticated species. Emphasis placed on application of the principles to domestic animal behavior. GE credit: SciEng | SE. — II. — II. Tucker

106. Domestic Animal Behavior Laboratory (2)
Laboratory—6 hours. Prerequisite: course 104 or the equivalent. Research experience with the behavior of large domestic animals. Experimental design, methods of data collection and analysis, and reporting of experimental results. GE credit: SciEng, Wrt | SE, Wrt | SL—II. (II.) Tucker

112. Sustainable Animal Agriculture (3)
Lecture/discussion—3 hours. Prerequisite: Biological Sciences 28 or course 1, Statistics 100 or Plant Sciences 120 recommended. Current applications of sustainable animal agriculture including the challenges of animal production, animal needs, animal well-being, and protection of the environment and resources for future food supply systems. Various scenarios for meeting sustainability objectives are evaluated using computing modeling. GE credit: SciEng or SoSci | OL, QL, SE or SS—III. (III.) Keereband

115. Advanced Horse Production (4)
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 15; Biological Sciences 101; Nutrition 115; Neurobiology, Physiology, and Behavior 101; or consent of instructor. Feeding, breeding, and management of horses; application of the basic principles of animal science to problems of production of all types of horses. Designed for students who wish to become professionally involved in the horse industry. GE credit: SciEng | QL, SE, SL, WE—I. (I.) Rossi

118. Fish Production (4)
Lecture—3 hours; discussion—1 hour. Prerequisite: Wildlife, Fish, and Conservation Biology 120 and 121. Current practices in fish production; relationship between the physiological aspects of a species and the production systems, husbandry, management, and marketing practices utilized. Emphasis on species currently reared in California. GE credit: SciEng | QL, SE, SL, WE—III. (III.) Fadel

119. Invertebrate Aquaculture (4)
Lecture—3 hours; discussion—1 hour. Prerequisite: Biological Sciences 18. Management, breeding and feeding of aquatic invertebrates; application of basic principles of physiology, reproduction, and nutrition to production of mussels and crustaceans for human food; emphasis on interaction of species biology and managerial techniques on production efficiency. GE credit: SciEng | SE—III. (III.) Fadel

120. Principles of Meat Science (3)
Lecture—3 hours. Prerequisite: Biological Sciences 1A. Anatomical, physiological, developmental, and biochemical aspects of muscle underlying the conversion of muscle to meat. Includes meat processing, preservation, microbiology, and public health issues associated with meat products. (Same course as Food Science and Technology 120.) GE credit: SciEng, SL

120L. Meat Science Laboratory (2)
Discussion—1 hour; laboratory—3 hours. Prerequisite: Biological Sciences 1A; course 120 (may be taken concurrently). Laboratory exercises and student participation in transformation of live animal to carcass and meat, structural and biochemical changes related to meat quality, chemical and sensory evaluation of meat, and field trips to packing plant and processing plant. Course as Food Science and Technology 120L. GE credit: SciEng | SE

123. Animal Growth and Development (4)
Lecture—3 hours; lecture/discussion—1 hour. Prerequisite: Animal Biology 103 or Biological Sciences 103. Growth and development of animals from conception to maturity, viewed from practical and biological perspectives; includes genetic, metabolic, nutritional, and endocrine control of growth and function. GE credit: SciEng | OL, QL, SE, VE, WE—III. (III.) Ross

124. Lactation (4)
Lecture—3 hours; laboratory—3 hours. Prerequisite: Neurobiology, Physiology, and Behavior 101; Animal Biology 103 or the equivalent or consent of instructor. GE credit: SciEng | OL, QL, SE, VE, WE—III. (III.) Ross

125. Equine Exercise Physiology (3)
Lecture—3 hours. Prerequisite: Neurobiology, Physiol- ogy, and Behavior 101 and 103 or the equivalent. Basic and applied physiology of the exercising horse. Includes physiological systems, gait analysis, lameness, pharmacology, sports medicine, sport horse performance evaluation and conditioning. Offered in alternate years. GE credit: SciEng | SE—III.

126. Equine Nutrition (3)
Lecture—3 hours. Prerequisite: course 15, Nutrition 115. Equine digestion, digestive physiology, diet development and evaluation. Focus on the relationship of the topics to recommended feeding practices and nutritional portfolios. Offered in alternate years. GE credit: SciEng | SE—III.

127. Advanced Equine Reproduction (3)
Lecture—3 hours. Prerequisite: upper division physiology course or consent of instructor, Physiology, and Behavior 101 and an advanced horse production and management course (e.g., course 115). Reproductive biology of the mare and stallion. Emphasis on structure/function relationships as they are applied to improving equine reproductive management and efficiency. GE credit: SciEng, Wrt | SE, VE—III. (III.) Fadel

128. Agricultural Applications of Linear Programming (4)
Lecture—2 hours; laboratory—2 hours; discussion—1 hour. Prerequisite: upper division and Agricultural Systems and Environment 21 or the equivalent. Applications of linear programming in agriculture, emphasizing resource allocation problems and decision making. Problems include crop production, livestock production, and management. GE credit: SciEng, Wrt | SL, WE—III. (III.) Fadel

137. Animal Biochemistry Laboratory (2)
Lecture—1 hour; laboratory—1 hour. Prerequisite: Animal Biology 102 or Biological Sciences 102 or the equivalent. Chemical and biochemical methods, and instruments commonly used in animal science. Wet chemical methods, UV/visible and atomic absorption spectrophotometry, thin-layer and gas-liquid chromatography, commercial chemical kits. Attention to safety. GE credit: SciEng | QL, SE, SL—I. (I.) Chung

140. Management of Laboratory Animals (4)
Lecture—3 hours; laboratory—3 hours. Prerequisite: Neurobiology, Physiology, and Behavior 101. Laboratory animal management procedures in view of animal physiology, health and welfare, government regulations, and experimental needs. Clinical techniques using rodents and rabbits as models. GE credit: SciEng | SE—I. (I.)

142. Companion Animal Care and Management (4)
Lecture—3 hours; discussion—1 hour. Prerequisite: course 42; Biological Sciences 101, Neurobiology, Physiology, and Behavior 101; Animal Biology 102 and 103 recommended. Management and production of companion animals. Integration of the disciplinary principles of behavior, genetics, nutrition, and physiology as related to the care of companion animals. GE credit: SciEng | OL, QL, SE, SL, VE, WE—I. (I.) Oberbauer

144. Beef Cattle and Sheep Production (4)
Lecture—3 hours; laboratory—3 hours; Saturday field trips. Prerequisite: Nutrition 115, Neurobiology, Physiology, and Behavior 101. Care and management of swine, poultry, and sheep, their systems of reproduction, and environmental effects related to the care of companion animals. GE credit: SciEng | QL, SE, SL, WE—III. (III.) Fadel

147. Pig and Poultry Care and Management (4)
Lecture—3 hours; laboratory—3 hours; Saturday field trips. GE credit: SciEng | QL, SE, SL, WE

151. Beef Cattle and Sheep Production (4)
Lecture—3 hours; laboratory—3 hours; one or two Saturday field trips. Prerequisite: course 41; Animal Genetics 107, Nutrition 115, or consent of instruc-
Animal Science and Management

146. Dairy Cattle Production (5)
Lecture—3 hours; laboratory—3 hours; fieldwork—1 hour; discussion—1 hour. prerequisite: course 143 or 144 or consent of instructor. Examination of distribution systems, marketing practices, product quality, impact of government policy (domestic and foreign), marketing alternatives, and product development. GE credit: SciEng | SE.

147. Farrier Science Laboratory (1)
Lecture—3 hours. prerequisite: course 115. distance learning class broadcast from California Polytechnic State University San Luis Obispo, California Polytechnic State University Long Beach, and California State University Fresno. In-depth examination of the structure-function relationship of the equine hoof and how it relates to conformation, injury, and performance. GE credit: SciEng | SE.

149L. Farrier Science Laboratory (1)
Lecture—3 hours. prerequisite: course 149 [may be taken concurrently] or consent of instructor. the art and science of shoeing in equine related fields. Proper use—1 hour. the materials and techniques in the fabrication of shoes and safe preparation of the hoof for application of shoes. (P/NP grading only.)

150. Ethics of Animal Use (4)
Lecture—3 hours; discussion—1 hour. prerequisite: any basic course in composition or speech. Ethical issues relating to animal use in contemporary society. Integration of philosophical theories with scientific evidence, behavior, mental, and welfare. Uses of animals in agriculture, research, and as companions. Ethical responsibilities regarding wildlife and the environment. GE credit: SciEng | SE, VL. Wrt | OL, QL, SS, VE, VL, WE.—III. (III.) Kebreab

190C. Research Group Conference (1)
Discussion—1 hour. prerequisite: advanced standing; consent of instructor. weekly conference on research problems, progress and techniques in the animal sciences. May be repeated for credit. (P/NP grading only.)—II, III, (I, II, III.)

192. Internship in Animal Science (1-12)
Internship—3-36 hours. prerequisite: completion of 84 units and consent of instructor. Internship off and on campus in dairy, livestock and aquaculture production, research, and management; or in a business, industry, or agency associated with these or other animal enterprises. All requirements of Internship Approval Form must be met. (P/NP grading only.)—I, II, III, (I, II, III.)

194A. Undergraduate Honors Thesis in Animal Science (4)
Lecture—1 hour; laboratory—9 hours. prerequisite: Neurobiology, Physiology, and Behavior 101, Animal Biology 103, minimum cumulative GPA of 3.200 and selection by the Honors Selection Committee. students will carry out a research project [chosen from faculty-suggested or approved proposals] during the academic year under the guidance of a faculty member. upon completion, student will write a thesis and present a public seminar describing his/her research. (Deferred grading only; pending completion of sequence.) GE credit: SciEng | OL, SE.

194HB. Undergraduate Honors Thesis in Animal Science (4)
Lecture—1 hour; laboratory—9 hours. prerequisite: Neurobiology, Physiology, and Behavior 101, Animal Biology 103, minimum cumulative GPA of 3.200 and selection by the Honors Selection Committee. students will carry out a research project [chosen from faculty-suggested or approved proposals] during the academic year under the guidance of a faculty member. upon completion, student will write a thesis and present a public seminar describing his/her research. (Deferred grading only; pending completion of sequence.) GE credit: SciEng | OL, SE.

194HC. Undergraduate Honors Thesis in Animal Science (4)
Lecture—1 hour; laboratory—9 hours. prerequisite: Neurobiology, Physiology, and Behavior 101, Animal Biology 103, minimum cumulative GPA of 3.200 and selection by the Honors Selection Committee. students will carry out a research project [chosen from faculty-suggested or approved proposals] during the academic year under the guidance of a faculty member. upon completion, student will write a thesis and present a public seminar describing his/her research. (Deferred grading only; pending completion of sequence.) GE credit: SciEng | SE, VL.

197T. Tutoring in Animal Science (1-2)
Tutorial—1-2 hours. prerequisite: Animal Science or related major, advanced standing, consent of instructor. Tutoring of students in lower division animal science courses; weekly conference with instructors in charge of courses; written critiques of teaching procedures. May be repeated for credit. (P/NP grading only.)

198. Directed Group Study (1-5)
Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5)
Prerequisite: consent of instructor. (P/NP grading only.)

Graduate
200. Strategies in Animal Production (4)
Lecture/discussion—4 hours. prerequisite: consent of instructor. Examines the forces and issues in animal agriculture through the strategic management process.

206. Models in Agriculture and Nutrition (3)
Lecture—2 hours; laboratory—3 hours. prerequisite: Mathematics 16B; Statistics; basic model building techniques and principles for statistical and systems simulation models. Optimization techniques for non-linear experimental designs and management models are presented. Qualitative analysis and evaluation of linear and non-linear equations used in agriculture and nutrition.

259. Literature in Animal Science (1)
Seminar—1 hour. prerequisite: graduate standing. Critical presentation and analysis of recent journal articles in animal science. May be repeated for credit up to nine times. (S/U grading only.)

290. Seminar (1)
Seminar—1 hour. Reports and discussions of topics of interest in genetics, nutrition, and physiology as they apply to animal science. (S/U grading only.)—I, III, (II, III.)

299. Research Group Conference (1)
Discussion—1 hour. prerequisite: graduate standing. Weekly conference on research problems, progress and techniques in the animal sciences. May be repeated for credit. (S/U grading only.)—I, III, (II, III.)

297. Supervised Teaching in Animal Science (2)
Supervised teaching—6 hours. prerequisite: consent of instructor. Practical experience in teaching Animal Science at the University level, curriculum design and evaluation; preparation and presentation of material. Assistance in laboratories, discussion sections, and evaluation of student work. An evaluation letter sent to the Graduate Adviser with a copy to the student. (S/U grading only.)—I, III, (II, III.)

298. Group Study (1-5)
Prerequisite: consent of instructor. (Sect. 1, 2, 3—letter grading; from Sect. 4 on—S/U grading only.)

299. Research (1-12)
(S/U grading only.)

Animal Science and Management

[College of Agricultural and Environmental Sciences]
Master Adviser: J.G. Fadel
Advising Center for the major [including peer advising] is located in 1202 Meyer Hall 530-754-7915. Each student will be assigned a faculty adviser through this office upon entering the major. http://ag.ucdavis.edu

The Major Program
The Animal Science and Management major combines a thorough education in the basic biology of domestic animal species with a strong background in agricultural economics. Graduates of this interdisciplinary major will be well positioned to adjust to our rapidly changing world and job market.

The Program. The interdisciplinary program in Animal Science and Management combines a fundamental background in the natural sciences (chemistry, biology, physiology, nutrition, genetics, mathematics, and behavior), with an understanding