Animal Sciences and Agricultural Education

College of Agricultural Sciences and Technology

Department of Animal Sciences and Agricultural Education

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http://cast.csufresno.edu/ansci/

B.S. in Animal Sciences

Options:

- Science
- Production Management

B.S. in Agricultural Education

Options:

- Agricultural Communications
- Teacher Preparation

M.A. in Special Major

Animal Science

Minor in Animal Sciences

Agricultural Specialist Credential

Animal Sciences and Agricultural Education

Prepare for the future in agricultural sciences, technology, and management with a degree in animal sciences or agricultural education. The Department of Animal Sciences and Agricultural Education offers options in agricultural communications, teacher preparation, science, and production management. The science option has career specialization in the areas of basic animal science and preveterinary medicine. The production management option offers career specialization in the areas of dairy science, equine science, meat technology and livestock business management. Courses integrate animal evaluation, behavior, disease, environmental management, genetics, health, marketing, muscle biology, nutrition, physiology, production, and reproduction.

The agricultural education major is designed to prepare students for positions as agricultural communication specialists and vocational agriculture teachers. Specializations may be developed in animal sciences, plant sciences, or mechanized agriculture.

Instructional Facilities

Instruction in the animal science disciplines is enhanced through practical application at the various farm laboratory units. The Beef, Dairy, Horse, Meats, Poultry, Sheep, and Swine units are maintained to support this educational purpose. In addition, veterinary and physiology laboratories are utilized to complement on-campus education. A 4,300-acre livestock and range management facility and another 800 acres of rangeland in the Sierra foothills are available.

Career Opportunities

Students specializing in animal science prepare for careers in the livestock industry where they may be engaged in consultation, management, production, research, teaching, or other professional services as well as careers in business, government and foreign service. Students specializing in agricultural education may pursue a variety of challenging careers in the educational field.

The courses offered in the programs listed in the copy that follows provide the necessary background to prepare students for careers in the agricultural industry.

Agricultural Communications. Combines courses in agriculture with a journalism core and a specialty in advertising, news-editorial, photo communications, public relations, or radio-television designed to train students for employment opportunities in the field of communication.

Basic Animal Science. Provides a science oriented curriculum in the disciplines of animal science. Prepares students for postbaccalaureate study or careers related to science, research, and the technical aspects of animal science.

Dairy Science. Prepares students for commercial and registered dairy herd management, breed association representatives, artificial breeding services, dairy sanitation, milk quality control, and other dairy-related occupations.

Equine Science. Prepares students for careers in the equine industry by combining coursework in horse production, advanced horse management, equine nutrition and other related subjects with hands-on experience and internships at our on-campus Quarter Horse Unit and at local horse farms. Courses in equitation and horsemanship at our Student Horse Center compliment the major and provide vocational opportunities to students as well.

Meat Technology. Prepares students for employment in the meat industry by offering courses in the areas of meat science, muscle biology, food science and nutrition, food chemistry, and marketing.

Preveterinary Medicine. Provides a structured program of courses in animal science and related biological/physical sciences which prepares students for admission to schools of veterinary medicine and for employment in the animal health industry.

Livestock Business Management. Provides a curriculum designed to support a strong core of animal science with specialized training in agricultural business. Students who select this option may wish to consider a Minor in Agricultural Business.

Teacher Preparation. Prepares students for positions as vocational agriculture teachers. (See *Agricultural Education Major*.)

Faculty

Arthur A. Parham, *Chair*

Anne V. Rodiek, *Graduate Coordinator*

Richard A. Rogers, *Agricultural Education Credentialing Coordinator*

Randy C. Perry

Jon D. Robison

Michael W. Thomas

Scott A. Williamson

The faculty members represent diverse specializations in the disciplines of animal science and teacher training. With doctoral degrees from many of the nation's outstanding agricultural universities, the faculty have combined philosophies of undergraduate education, research, curriculum development, industry relations, and career placement into a unique program. Their experience combines the practical and theoretical aspects of the animal sciences to provide an education second to none. Students are assigned an adviser who assists in both academic and career planning on an individual basis. The faculty place a high priority on strong adviser-advisee relationships.

Bachelor of Science Degree Requirements

Animal Sciences Major

Choose one option and one specialization under that option.

Options: Science, Production Management.

Units

General Education 51
(including 12 upper-division units, to be taken no sooner than the term in which 60 units of coursework are completed)

BREADTH
(see Additional Requirements area for department required G.E. courses for the following Breadth areas: B1, B2, D3, E)
Breadth Sub-area C2: ENGL 20 (recommended)

INTEGRATION
Sub-area 1B: CHEM 170 or N SCI 120 or PLANT 105 (recommended)

Program requirements 62-88
Animal Science Core .....(42)
A SCI 1, 35, 65, 101, 125, 135, 145, 155, 165, 171, 186
Select two from the following: A SCI 21, 31, 41 51**, 61**, 91
Select one from the following: A SCI 180, 181, 190, 194

Production Management Option
Career specialization *(choose one)*

Livestock Business Management Specialization ..... (22-23)
A SCI 11, 81, 156
Select 12 units from: A G EC 28 or B A 18; AG EC 31 or ACCT 4A; AG EC 110*** or 110N or 120; AG EC 117, 130; AG EC 160 or 164
Select one of: A SCI 121, 131, 151, 161, 172

Dairy Science Specialization ..... (20-23)
AG EC 110N or 117 or 120; A SCI 61**, 146, 156, 161, 162, 163
Select 3 units from: AG EC 31, 110***, 130, 160, 162; FSC 3

Equine Science Specialization ..... (13-17)
AG EC 110N or 117 or 120

Choose two of: A SCI 52, 53, 54, 55, 187
A SCI 51**, 151, 156, 185T (topics related to equine)

Meat Technology Specialization .....(19)
A SCI 11, 172, FSC 110, 125, 178
CHEM 8; 150

Additional requirements ...(7-23)
(for all Production Management Specializations)
AG EC 1; 76 or C SCI 101 or IS 50; A SCI 67; MICRO 20 or 140; BIOL 10 or ZOOL 10; CHEM 3A

Science Option
Career specialization *(choose one)*

Basic Animal Science Specialization ..... (15-16)
A SCI 156
Choose one of: A SCI 121, 131, 151, 161, 172
BIOSC 1B; CHEM 8, 150

Additional requirements ....(16)
AG EC 76 or C SCI 101 or IS 50; MICRO 20 or 140; BIOSC 1A; CHEM 1A

Preveterinary Medicine Specialization ..... (23-27)
A SCI 68; BIOSC 1B; CHEM 1B, 8 or 128A/B, 108*** or 129A, 150; PHYS 2A

Additional requirements ....(19)
AG EC 76 or C CSI 101 or IS 50; A SCI 67; MICRO 20 or 140; CHEM 1A; BIOSC 1A

Electives* 0-15

Total minimum requirements 128

* It is anticipated that 13 units required for the major will also satisfy General Education requirements

** Equine specialization majors are required to take A SCI 51. Dairy specialization majors are required to take A SCI 61 from the core requirements.

*** This course has a prerequisite course not listed among the requirements.

Advising Notes

1. Mandatory advising is required of all students in the degree program. See the administrative support coordinator for the name of your assigned adviser.
2. New students should request an option advising check sheet from the department office.

3. All students should make an appointment with their assigned faculty adviser prior to registration each semester.
4. *CR/NC* grading is not permitted for courses included in the major unless the courses have been designated *CR/NC* grading only.
5. Fifty-one units of General Education may be exceeded depending upon the selection of courses.
6. Some General Education courses may be double counted to simultaneously satisfy major as well as General Education requirements. Consult your adviser for clarification.
7. The upper-division writing skills requirement can be met by passing the university examination (UDWE) or by taking an approved upper-division writing skills course, to be taken no sooner than the term in which 60 units are completed. One unit of credit in ENGL 100W may be earned for passing the exam if requested by the student; three to four units of credit will be earned by obtaining a letter grade of *C* or higher in an approved course.
8. One semester prior to graduation make an appointment with your faculty adviser to prepare an official Certification of Major Requirements form.
9. Preveterinary medicine students should consult their faculty adviser regarding entrance requirements and admissions procedures to veterinary school. Total number of units will exceed 128 if a student chooses to meet all of the Veterinary Medicine entrance requirements. Additional courses such as PHYAN 135 and PHYS 2B may be required.

Bachelor of Science Degree Requirements

Agricultural Education Major

Options: Agricultural Communications, Teacher Preparation

Units

General Education 51
(including 12 upper-division units, to be taken no sooner than the term in which 60 units of coursework are completed)

15 units of G.E. requirements are included among Additional Requirements in G.E. areas as noted in brackets [ ].

Major 54-59
(including 20 upper-division units)
Select *Teacher Preparation* or *Agricultural Communications*

Teacher Preparation Core .... (36)
Agricultural Economics..... (6)
AG EC 31, 110N or 120
Animal Science ..... (9)
A SCI 1, 11; select one of the following: A SCI 21, 31, 41, 61, 91
Plant Science ..... (12)
CR SC 1; OH 1; SW 100; VTF 110
Mechanized Agriculture ..... (9)
ME AG 1, 50, 114

Teacher Preparation Career Specialty ..... (18)
Select one: Animal Science, Mechanized Agriculture, or Plant Science (see *Teacher Preparation Option check sheet available in the department office.*)

Agricultural Communications Core ..... (47)
Agricultural Economics ..... (6)
AG EC 66, 153
Agricultural Education..... (3)
AG ED 150
Mass Communication and Journalism..... (11)
MCJ 1, 10, 104
Plant Science ..... (12)
CR SC 1; OH 1; SW 100; VTF 110
Mechanized Agriculture ..... (3)
ME AG 20
Food Science and Nutrition..... (3)
FSC 3
Animal Science ..... (9)
A SCI 1, 11, 21 or 31 or 41 or 51 or 61 or 91

Agricultural Communications Career Specialty ..... (14-16)
Select one: Advertising, News-Editorial, Photo Communications, Public Relations, Radio and Television (see *Agricultural Communications Option check sheet available in the department office.*)

Additional requirements 20-36
CHEM 3A [B1]; BOT 10 or ZOOL 10 [B2]; ENGL 20 [C2]; AG EC 1 [D3]; A SCI 67 [E]
Teacher Preparation ..... (19)
Upper-division writing skills
Teacher Education requirements: AG ED 135, 150, 187, 189; EHD 50; H S 121
Agricultural Communications ..... (3)
Upper-division writing skills (MCJ 102W required)
(*Note*: It is anticipated that some of the aforementioned courses will also meet General Education requirements.)

Electives 2-11
Courses supplementary to the major are strongly recommended.

Total minimum requirements 128
(including 40 upper-division units)

Advising Notes

1. See *Advising Notes 1-8* following animal sciences major.
2. Teacher preparation majors seeking a Single Subject Teaching Credential are urged to take the Upper-Division Writing Examination (UDWE) at least once. Those who pass the examination may receive one unit of credit. (For details consult the Office of Testing Services.)
3. Contact the Admissions Office of the School of Education and Human Development for requirements related to the California Basic Educational Skills Test (CBEST).
4. Agriculture courses titled *Tours* or *Lectures* may be used to satisfy upper-division unit requirements but may not be counted to satisfy agricultural education core or specialized field requirements in the major.
5. Candidates for the Agriculture Specialist Credential must possess 3,000 hours or two years of occupational experience in agriculture. (For details, consult the agricultural education credentialing coordinator.)
6. Agricultural communications students must take and pass the Language Qualification Examination. A screening examination administered by the Mass Communication and Journalism Department must be passed before permission is given for enrollment in MCJ 10 and in

most of the other journalism writing and editing courses. (See prerequisites for each course before attempting to enroll.) Students who do not pass the Language Qualification Examination may retake it the following semester.

Single Subject Credential Waiver Program

Completion of the Bachelor of Science degree in Agricultural Education meets the requirements of the Single Subject Waiver Program. The Single Subject Credential authorizes the holder to teach *general agriculture* in grades 7-12. Students with a B.S. degree in another agricultural major may obtain a Single Subject Credential by completing the remaining coursework required for the B.S. degree in Agricultural Education.

Credential candidates must pass examinations in reading, writing, and mathematics in addition to other numerous state of California and California State University, Fresno requirements. Consult the agricultural education major adviser and the School of Education and Human Development for details; file an official program of study.

Agricultural Specialist Credential Program

The Agricultural Specialist Credential, which authorizes holders to teach secondary school vocational agriculture, is offered jointly by the College of Agricultural Sciences and Technology and the School of Education and Human Development. It requires completion of the Single Subject Waiver Program (see above), professional education courses (see *Education — Single Subject Credential — Program Requirements, Professional Preparation*), and an approved fifth-year program of 30 postgraduate units including AG ED 135, 150, 187, 189; EHD 155B; CTET 161; and AGRI 280, 281.

Animal Sciences Minor

This program is designed for agricultural business majors. Students in other majors who desire additional technical and animal management skills may also opt for this minor. Additional livestock knowledge and experience will help the manager or consultant relate to and communicate with employees or clients.

Students should consult with a faculty adviser in the Animal Sciences Department to plan the minor. The adviser and department chair must approve the minor program before it can be certified by the school dean. It is then filed with the Evaluations Office and recorded on the transcript.

A Minor in Animal Sciences consists of a minimum of 21 units. Nine of the units must be upper division.

	Units
Core Requirements	
Intro Animal Sciences: A SCI 1	**3**
Livestock Evaluation: A SCI 11	**3**
Animal Nutrition: A SCI 35	**3**
Farm Animal Environment: A SCI 101	**3**
Focus Areas	
Animal Science Principles	**3-6**
Production and Management	**3-6**
Total	**21**

Advising Notes

1. Obtain Animal Sciences Minor advising sheet from a faculty adviser for selection of courses in each of the focus areas.
2. Courses in a major cannot be applied toward a minor unless designated as additional requirements.
3. All courses in the minor must be taken for a letter grade. *CR/NC* grading is not acceptable.
4. A minor may be earned only at the time a student earns the first baccalaureate degree.

Master of Arts Degree Program

The Master of Arts in Special Major is a program of advanced study in animal science available through a specially constructed M.A. in Special Major. This program is a 30-unit degree program designed to extend professional competence in animal research, production, and agricultural education, and to provide the first graduate degree for students anticipating advanced graduate work in the animal sciences. Coursework in animal science includes animal nutrition, meats, physiology, breeding and genetics, management, and health. Appropriate coursework in agricultural education, chemistry, biology, food science or business may also be taken with approval to meet the needs of individual student programs. Full-time graduate students may earn the degree within two years when working closely with an adviser. To accommodate part-time students, graduate courses are offered in the late afternoon or evening.

Admission Requirements. The Master of Arts in Special Major with a focus on Animal Science assumes preparation equivalent to a bachelor of science degree in animal science or agricultural education from an accredited institution. The preparatory baccalaureate degree must include the following courses or their equivalents:

- A SCI 35 and three of the following five courses: A SCI 125, 135, 145, 155, 165;
- BIOSC 1A or ZOOL 10;
- CHEM 1A or 3A;
- two of the following courses: CHEM 8, 150; MICRO 20, PHYS 2A and 2B; and
- two animal science production courses.

The above courses or equivalents must be completed prior to enrollment in courses which will be applied to the master's program.

Admission to unclassified postbaccalaureate standing by the university does not imply acceptance in the Master of Arts in Special Major program.

Applicants whose preparatory education was principally in a language other than English must earn a minimum TOEFL score of 550.

Admission Materials. To be considered for admission to the graduate program, the candidate must submit the following materials: evidence of a baccalaureate degree in animal science or agricultural education, or a related field with appropriate preparatory coursework from an accredited institution; official transcripts of all college work; scores from the Graduate Records Examination General Test (GRE); an application for graduate/post baccalaureate admission; three letters of reference from employers or faculty at the university attended most recently; and a statement of 500 words or less indicating reasons for pursuing a master's degree.

Admission Criteria. Candidates for admission will be evaluated using the following criteria: undergraduate coursework; grade point average of 3.0 or better (last 60 semester units); recommended GRE scores (480V/580Q are equivalent to the 50th percentile); 500-word statement of professional goals; and three letters of recommendation. Students lacking in any area with compensating strengths in other areas are encouraged to apply.

Classified standing will be granted to students who meet all of the admission criteria. Conditional classified standing may be granted to applicants with a 2.75-2.99 GPA (last 60 semester units) and/or those required to complete prerequisite coursework. Prerequisite coursework is not included in the 30-unit master's program. Students must request classified standing in the program by the semester in which a maximum of 10 units to be used toward the degree are completed.

Prerequisite Requirements. PLANT 99, AG EC 71 or MATH 101 (one course), and BOT 130, CHEM 105, 109, 151, or FSC 115 (one course), are required.

Program Requirements

The student, under the direction of a graduate adviser, prepares and submits a coherent program individually designed within the following framework:

	Units
Core	**12**
AGRI 200, 201 (or BIOL 274), 220, 229 (1+1+1)	
Electives	**14**
100-200 level courses with prior approval of adviser and thesis committee. Courses may be chosen from the following: AGRI 240T, 241, 242, 246, 247, 248, 290	
AG ED 280, 281	
CHEM 150, 151, 153, 156	
Courses in agriculture, business, food science, biology, or other	
Culminating experience	**4**
AGRI 299	
Total minimum requirements	**30**

Graduate Advising Notes

1. Several of the 200-level and approved elective courses have prerequisites other than courses listed as admission requirements.
2. Students must request specific information concerning the program from the department office.
3. Upon admission, students should see the graduate coordinator for assistance in program planning, selection of graduate adviser, and selection of a thesis committee.
4. To progress through the graduate program, the student must:
   a. Maintain a minimum 3.0 GPA
   b. Complete all prerequisite coursework
   c. Attain classified standing
   d. Meet university graduate writing requirement
   e. File for advancement to candidacy
   f. Complete the program requirements
   g. File a master's thesis committee assignment form
   h. Formally present and defend the thesis research results
5. Advancement to candidacy requires the completion of 9 program units in residence (minimum GPA of 3.0), meeting the university graduate writing skills requirement, departmental requirements, and filing a petition of advancement to candidacy no later than one semester prior to enrollment in thesis and by the deadline.
6. The student shall meet the graduate writing proficiency requirement by earning a *B* or better in AGRI 220.
7. The student may apply a maximum of 2 units of independent study to the master's program.
8. A maximum of 9 units of 100-level courses may be used to meet degree requirements.
9. See *Division of Graduate Studies* in this catalog for university requirements.

COURSES

Note: Active immunization against tetanus (available through Student Health Services) is a prerequisite for registration in any laboratory course in agriculture and for any student employment on the University Farm.

Note: Cost to the student of extended field trips varies each semester depending upon itinerary. The student should ask the course instructor.

Animal Science Principles (A SCI)

1. Introduction to Animal Science (3)
Overview of the livestock and poultry industry; types and breeds, world distributions, foods and products from farm animals, reproduction, genetics, nutrition, and marketing. (2 lecture, 2 lab hours)

35. Feeds and Feeding (3)
Prerequisite: CHEM 3A. Principles of nutrition; nutrients and their metabolism; comparison of qualitative nutrient requirements of non-ruminant and ruminant animals and formulating diets to meet these requirements. (2 lecture, 3 lab hours)

65. Introduction to Animal Health (3)
The stockman's approach to animal health and disease control in domestic animals. Classification of animal diseases, their causes and appropriate treatments with emphasis on preventative medicine. (2 lecture, 3 lab hours) (Formerly A SCI 65A)

67. Animals and Society (3)
Philosophical, ethical, and scientific investigation of the human/animal bond and the significance of animals in our society. Importance of animals in wellness, rehabilitation/convalescence, and stress management. Interdisciplinary investigation of controversies in animal research and human disease. G.E. Breadth E1.

101. Environmental Management of Farm Animals (3)
Prerequisite: A SCI 1. Basic principles of environmental management as applied to domestic farm animals. Special emphasis given to animal behavior, animal welfare, and animal performance. The optimal animal environment will be studied in detail.

125. Animal Genetics (3)
Prerequisite: A SCI 1. Genetic principles and application to livestock production; basic inheritance, qualitative genetics, variation in economic traits of livestock, quantitative inheritance, selection progress; current methods of genetic livestock improvement.

135. Animal Nutrition (3)
Prerequisite: A SCI 35. Principles of nutrition and metabolism; digestive physiology of farm animals.

145. Anatomy and Physiology of Farm Animals (3)
Prerequisite: BIOL 10 or ZOOL 10. General structures of farm animals and physiological functions of organs in the animal body. (Formerly A SCI 145A)

146. Physiology of Lactation (3)
Fundamentals of anatomy, physiology, and endocrinology of milk synthesis and secretion; milking machine systems and management; pathological and environmental factors affecting lactation.

155. Animal Reproduction (3)
Prerequisite: A SCI 145. Principles of reproductive physiology, associated endocrine hormones, and their application to domestic animals.

156. Artificial Insemination — Embryo Transfer (1)
Prerequisites: A SCI 145, 155 (or concurrently). Basic principles of artificial insemination and embryo transfer with emphasis on application to cattle. (3 lab hours)

163. Dairy Cattle Nutrition (3)
Prerequisite: A SCI 135. Principles of dairy cattle nutrition. Nutritional requirements of the dairy calf through the mature cow. Special emphasis on computerized diet formulation and feed inventory control.

165. Infectious Diseases of Domestic Animals (4)
Prerequisite: BIOL 10 or ZOOL 10. Microbiological concepts related to bacterial, viral, and fungal diseases in domestic animals with emphasis on specific diseases of veterinary importance. (3 lecture, 3 lab hours)

Production and Management (A SCI)

11. Livestock Selection and Evaluation (3)
Prerequisite: A SCI 1 or concurrently. Basic factors involved in selection and evaluation of livestock; relationships of live market animal traits to carcass cutability and quality. (2 lecture, 3 lab hours)

21. Beef Cattle Production (3)
Prerequisite: A SCI 1 or concurrently. Overview of world and United States beef production. Evaluation of the structure of the beef industry (consumer, packer, retailer, feedlot, seedstock, commercial cow-calf, stocker). Discussion of genetics, nutrition, reproduction, and meat science as applied to beef cattle. (2 lecture, 3 lab hours)

31. Swine Production (3)
Prerequisite: A SCI 1 or concurrently. Management principles and practices of purebred and commercial pork production. Nutrition, reproduction, environmental management, health, marketing, selection, and records are studied. (2 lecture, 3 lab hours; field trips)

41. Sheep Production (3)
Prerequisite: A SCI 1 or concurrently. Management of purebred, commercial, and small farm flocks; principles and practices in breeding, feeding, care of ewes and lambs, and marketing of lamb and wool. (2 lecture, 3 lab hours)

51. Horse Production (3)
Prerequisite: A SCI 1 or concurrently. Not open to students with credit in A SCI 152A. Breeds selection, care, and feeding of light horses. (2 lecture, 3 lab hours)

52. Beginning English Equitation (2)
Basic horsemanship skills including haltering, grooming, saddling, and bridling; beginning English riding skills including proper body position at the walk, trot, and canter and simple use of aids to cue the horse; basic care of horse. (Two 2-hour activities) (Course fee, $150)

53. Intermediate English Equitation (2)
Prerequisite: A SCI 52 or equivalent. Development of a functional position to control and balance the horse at all three gaits (hunt seat style); beginning jumping; care and use of tack and equipment. (Two 2-hour activities) (Course fee, $150)

54. Beginning Western Horsemanship (2)
Basic horsemanship skills including haltering, grooming, saddling, and bridling; beginning Western riding skills at the walk, jog, and lope and simple use of aids to cue the horse. (Two 2-hour activities) (Course fee, $150)

55. Intermediate Western Horsemanship (2)
Prerequisite: A SCI 54 or equivalent. Western horsemanship skills to control and balance the horse at all three gaits and to perform other movements basic to the Western horse; care and use of tack and equipment. (Two 2-hour activities) (Course fee, $150)

61. Dairy Cattle Production (3)
Prerequisite: A SCI 1 or concurrently. Principles and practices of milking, feeding, breeding, evaluating, housing, health, behavior, and management of dairy cattle. (2 lecture, 3 lab hours)

68. Pre-Vet Orientation (1)
Detailed information for students preparing for veterinary school including course requirements, admission policies, application procedures, interview sessions, and career opportunities in vet medicine. (Formerly A SCI 185T)

81. Introduction to Livestock and Dairy Evaluation (3)
Introductory course in evaluating livestock for breeding and market purposes. Utilizes visual and performance data in establishing the economic value of animals representing the beef, sheep, swine, dairy, and horse industries. (2 lecture, 3 lab hours)

91. Poultry Production (3)
Prerequisite: A SCI 1 or concurrently. Management principles and practices of commercial poultry production. Nutrition, reproduction, environmental management, health, and processing of broilers and layers. (2 lecture, 3 lab hours) (Formerly A SCI 185T section)

121. Advanced Beef Management (4)
Prerequisite: A SCI 21. Prevailing and alternative management systems and techniques of beef production in the United States and California including economic analysis. (3 lecture, 3 lab hours) (Formerly A SCI 121A)

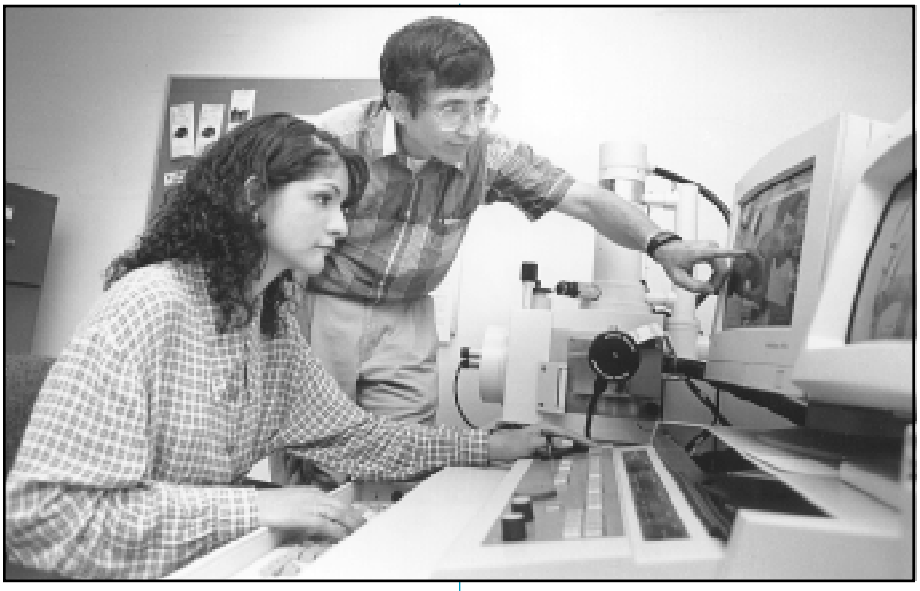
131. Advanced Swine Management (4)
Prerequisite: A SCI 31. A comprehensive study of the swine industry. Laboratory exercises designed to improve the management decision ability of students. (3 lecture, 3 lab hours; field trips) (Formerly A SCI 131A)

151. Advanced Horse Management (3)
Prerequisite: A SCI 51. Advanced principles of horse management, reproduction, breeding systems, nutrition, facilities, business aspects, exercise physiology, training colts. (2 lecture, 3 lab hours)

161. Advanced Dairy Farm Management (4)
Prerequisite: A SCI 61. A comprehensive study of daily industry management strategies and practices. Exercises involve recognition of problems and recommendation of solutions associated with managing commercial dairy operations. (3 lecture, 3 lab hours; field trips)

162. Dairy Systems Management (3)
Prerequisite: A SCI 61. A comprehensive study of technological systems employed in commercial dairies. Exercises involve analysis of systems for application in various facilities. The impact of these systems on the animal, on environment, and on economic viability is considered. (2 lecture, 3 lab hours)

171. Meat Science (4)
Prerequisite: A SCI 1 or concurrently. Basic meats course: inspection, factors that affect quality and quantity of meat, selection and preparation of meats and meat products, and safety regulations and requirements. Two lab sections offered: Lab A includes slaughtering and processing; Lab B is consumer



oriented processing without slaughtering. (3 lecture, 3 lab hours) (Formerly A SCI 171A)

172. Meat Technology (3)
Prerequisite: A SCI 171. Fabricating and pricing of wholesale and retail meats; technology of fresh and processed meat; sausage manufacturing; quality control. (2 lecture, 3 lab hours)

Special Topics and Industry Relations (A SCI)

94. Agri Internship (1-6; max total 6)
Prerequisite: minimum GPA of 2.0 and instructor approval. Emphasis on acquisition through experience of practical animal production skill integrated with basic principles acquired in the classroom. This course is for on-campus internships at animal science related units only. *CR/NC* grading only.

180. Undergraduate Research
(1-4; max total 4)
Open to juniors and seniors. Exploratory work on a suitable agricultural problem in animal science. Approved for *SP* grading.

181. Advanced Livestock and Dairy Evaluation (3; max total 6)
Prerequisite: A SCI 11 or 81 or permission of instructor. Detailed analysis of animal form related to functional efficiency, economic value, and sound livestock production management. Written and oral defense of judgments (dairy, horse, livestock, meats). (2 lecture, 3 lab hours; field trips)

182. Livestock Marketing and Show Management (1-2; max total 4)
Development of skills in the organization, administration, and operation of livestock activities at a district fair level. Emphasis on practical application of skills. (2 lab hours per unit)

183. Issues and Opportunities in Animal Sciences (2; max total 4)
Prerequisite: A SCI 1. Invited speakers provide insight on current industry issues. Comprehensive study of career opportunities available in animal science. Field experience is offered in specific areas.

185T. Topics in Animal Science
(1-4; max total 4 per discipline if no topic repeated)
Prerequisites: junior standing and permission of instructor. Anatomy, physiology, pathology, nutrition, genetics, livestock management. Topics may require labs.

186. Animal Science Seminar (1)
Prerequisite: senior standing or permission of instructor; 12 upper-division units in the major. Latest developments in research; assigned papers in animal science to be presented in both oral and written form.

187. Women's Equestrian
(2; max total 8)
(See ATHL 181.)

190. Independent Study
(1-3; max total 6)
See *Academic Placement — Independent Study*. Approved for *SP* grading.

194. Agricultural Internship
(1-8; max total 8)
Prerequisites: junior or senior standing and approval of internship committee. This course to be used by students doing off-campus, industry-related internships only. Emphasis on development of decision-making ability through industrial experience integrated with basic principles acquired in the classroom. *CR/NC* grading only.

196. Enterprise Management
(1; max total 6)
Prerequisites: A SCI 21, 31, or 41; ME AG 3; or permission of instructor; concurrent participation in project program required. Theory and field application of management principles in beef, sheep, swine, and other appropriate animal science enterprises.

Agricultural Education (AG ED)

80. Undergraduate Research
(1-4; max total 4)
Open to freshmen and sophomores with permission of instructor. Exploratory work on a suitable agricultural problem in agricultural education. Approved for *SP* grading.

115. FFA Activities (2; max total 4)
Organization and administration of various FFA activities. Parliamentary procedure and meeting organization; committee work and structure.

135. Introduction to Agricultural Education (3)
Survey of agricultural education in California, including qualifications for teaching agriculture, structure and content of vocational agriculture programs. Supervision of vocational youth organizations.

150. Agricultural Resources and Computer Applications (3)
Prerequisite: senior standing or permission of instructor; 12 upper-division units in the major. Development and application of techniques for obtaining and using resource materials including government documents, university and experiment station reports. Development of computer skills utilized in agricultural education. (2 lecture, 2 lab hours)

160T. Topics in Agriculture
(1-4; max total 6 per discipline if no topic repeated)
Prerequisites: junior standing and permission of instructor. Agricultural education. Topics may require lab hours.

180. Undergraduate Research
(1-4; max total 4)
Open to juniors or seniors with permission of instructor. Exploratory work on a suitable agricultural problem in agricultural education. Approved for *SP* grading.

187. Organization, Administration, and Supervision of Agricultural Education (3)
Prerequisite: senior standing. A study of the California and federal plans for vocational education as they pertain to agricultural education.

189. Education in Agricultural Mechanics (3)
Prerequisites: ME AG 1; junior standing. Strategies for organizing, teaching, and administering educational programs in agricultural mechanics for youth and adults.

190. Independent Study
(1-3; max total 6)
See *Academic Placement — Independent Study*. Approved for *SP* grading.

GRADUATE COURSES

The following courses are open to students who have been accepted into the graduate program. Students who are not in graduate standing should contact the department graduate coordinator prior to enrolling.

Agriculture (AGRI)

200. Biometrics in Agriculture (3)
Prerequisite: PLANT 99, AG EC 71, or MATH 101, or permission of instructor. Advanced concepts in the design of agricultural experiments. Emphasis is placed on the selection of appropriate designs to meet the objectives of well-planned experiments. Relative merits of various designs and topics in analysis, interpretation, and regression are covered.

201. Agricultural Laboratory Techniques (3)
Prerequisite: One of the following courses: BOT 130; CHEM 105, 109, 151; FSC 115. Agricultural problem solving through the application of advances in laboratory technology, crop management, foods, nutrition, soil and water quality. Theory and practice operation of scientific instruments and techniques are taught. Student-defined project and report required. (2 lecture, 3 lab hours)

220. Research Methodology and Communications (3)
Critical literature review, quantitative and qualitative research design, scientific writing, questionnaire design and use, and presentation of research results. Ethical research issues examined. Approved for *SP* grading.

229. Seminar (1; required total 3)
Prerequisite: permission of instructor. Students investigate and present current research problems. Observation and evaluation of additional assigned seminars. Oral and written reports required. (Formerly AGRI 260)

240T. Topics in Animal Science
(3; max total 12)
Prerequisite: upper-division animal science appropriate to study topic; permission of instructor. Investigation of topic in animal science; anatomy, physiology, pathology, nutrition, genetics, or economics. Topics may require lab hours.

241. Endocrine and Reproductive Physiology (3)
Prerequisite: A SCI 155. Physiology which deals with neural and hormonal integration and control of the animal body, including scientific aspects of the processes of reproduction and application of current knowledge in improving reproductive efficiency.

242. Environmental Physiology of Domestic Animals (3)
Prerequisite: A SCI 145; permission of instructor. A study of environmental factors affecting domestic animals under field and controlled conditions.

246. Ruminant Nutrition (3)
Prerequisite: A SCI 135, CHEM 150. Ruminant physiology of digestion, absorption, and metabolism and nutrients, and the relationship of enzymes and hormones.

247. Concepts in Non-Ruminant Nutrition (3)
Prerequisite: A SCI 135 or equivalent, graduate standing or consent of instructor. Digestion, absorption, nutrient utilization, and interrelationships in poultry, swine, and other non-ruminants.

248. Meat Science and Muscle Biology (3)
Prerequisite: A SCI 171, graduate standing or consent of instructor. Evaluation of muscle as meat; biological characteristics, growth and development of skeletal muscle, glycogen metabolism, and factors affecting quality of meat.

280. Seminar in Agricultural Education
(1-3; max see below)
Maximum total credit 9 units in any given area or any combination of the three areas. Prerequisite: permission of instructor; admission to teacher preparation program; bachelor's degree in agriculture. Advanced problems in agriculture; research and experimentation in a selected area: animal science, plant science, or agricultural mechanics. Approved for *SP* grading.

281. Problems in Agricultural Education
(1-3; max total 3)
Prerequisite: graduate standing. Individual supervised research in agricultural education; appropriate reports and evaluation required. Individual conferences.

290. Independent Study
(1-3; max total 6)
See *Academic Placement — Independent Study*. Approved for *SP* grading.

299. Thesis (2-4; max total 4)
Prerequisite: See *Criteria for Thesis and Project*. Preparation, completion, and submission of an acceptable thesis for the master's degree. Approved for *SP* grading.

IN-SERVICE COURSE

(See *Course Numbering System*.)

Agriculture (AGRI)

300. Topics in Agriculture
(1-3; max total 6)
Topics may require lab hours. In-service professional training in selected areas of agriculture.