190. Seminar in Avian Sciences (1)  
Seminar—1 hour. Prerequisite: upper division standing in Avian Sciences and consent of instructor. May be repeated three times for credit. (P/NP grading only).—I, II, III. (I, III)

192. Internship in Avian Sciences (1-12)  
Internship—3-36 hours. Prerequisite: completion of a minimum of 84 units, consent of instructor. Internship on and off campus in poultry, game birds or exotic bird production, management and research; or in a business, industry, or agency concerned with these entities. Compliance with Internship Approval form essential. (P/NP grading only)

195. Topics in Current Research (1-3)  
Lecture/discussion—1-3 hours. Prerequisite: consent of instructor. Discussion of topics of current interest in avian sciences. May be repeated three times for credit. —I, II, III, (I, III)

197T. Tutoring in Avian Sciences (1-3)  
Tutoring—1-3 hours. Prerequisite: Avian Sciences or related major, advanced standing, consent of instructor. Tutoring of students in lower division avian sciences courses; weekly conference with instructors in charge of courses; written critiques of teaching procedures. (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

203. Advanced Avian Development and Genomics (1)  
Discussion—1 hour. Prerequisite: graduate standing; concurrent enrollment in course 103. In consultation with the instructor, students develop a lecture and associated instructional materials, i.e., lesson plan, including justification, reading and presentation and evaluation aids. The topic must complement a topic covered in Avian Sciences 103 (Avian Development and Genomics).—I, II. (I)

209. Seminar (1)  
Seminar—1 hour. Reports and discussions of recent advances and selected topics of current interest in avian genetics, physiology, nutrition, and poultry technology.—I, II.

209C. Research Conference (1)  
Discussion—1 hour. Prerequisite: graduate standing and consent of instructor. Major professors lead research discussions with their graduate students. Research papers are reviewed and project proposals presented and evaluated. Format will combine seminar and discussion. (S/U grading only.)—I, II, III, (I, II, III)

297T. Supervised Teaching in Avian Sciences (1-4)  
Tutoring—1-4 hours. Prerequisite: graduate standing and consent of instructor. Tutoring of students in lower, upper division, and graduate courses in Avian Sciences; weekly conference with instructor in charge of course; written critiques of teaching methods in lectures and laboratories. (S/U grading only.)

298. Group Study (1-5)  
Prerequisite: consent of instructor.

299. Research (1-12)  
Prerequisite: consent of instructor. (S/U grading only.)

Avian Sciences  
(A Graduate Group)

Kirk Klausing, Ph.D., Chairperson of the Group  

Group Office: 1249 Meyer Hall  
530-752-2382; http://aviansciences.ucdavis.edu

Faculty  
C. Christopher Calvert, Ph.D., Professor  
Animal Science  
Thomas F. Coombs-Hahn, Ph.D., Associate Professor  
Neurobiology, Physiology, and Behavior  
Mary E. Delany, Ph.D., Professor  
Animal Science  
John M. Eadie, Ph.D., Professor  
Wildlife, Fish, and Conservation Biology, Animal Science  
Holly B. Ernst, D.V.M., Ph.D., Associate Professor  
Veterinary Genetics Laboratory and Population Health and Reproduction; School of Veterinary Medicine  
Michelle Hawkins, V.M.D., ABVP, Associate Professor  
Medicine and Epidemiology, School of Veterinary Medicine  
Joshua M. Hult, Ph.D., Assistant Adjunct Professor  
Animal Science  
Annie J. King, Ph.D., Professor  
Animal Science  
Kirk C. Klaising, Ph.D., Professor  
Animal Science  
Jenella E. Loye, Ph.D., Research Associate  
Entomology  
Joay A. Mench, Ph.D., Professor  
Animal Science  
James R. Millam, Ph.D., Professor  
Animal Science  
Gabrielle Nevitt, Ph.D., Professor  
Neurology, Physiology, and Behavior  
Joanne R. Paul-Murphy, D.V.M., Ph.D. Professor  
Medicine & Epidemiology, School of Veterinary Medicine  
Lisa A. Tell, D.V.M., Professor  
Medicine and Epidemiology, School of Veterinary Medicine  
Andrea Townsend, Ph.D., Assistant Professor  
Wildlife, Fish, and Conservation Biology

Emeriti Faculty  
Hans Abplanalp, Ph.D., Professor Emeritus  
Dan Anderson, Ph.D., Professor  
Francine A. Bradley, Ph.D., Specialist Emeritus  
Ralph A. Ernst, Ph.D., Specialist Emeritus  
Peter Marler, Ph.D., Professor Emeritus  
Barry W. Wilson, Ph.D., Professor Emeritus

Graduate Study. The Graduate Group in Avian Sciences offers the M.S. degree program to students who wish to pursue specialized advanced work on avian species. Specializations students may choose include behavior, nutrition, physiology, reproduction, pathology, immunology, toxicology, food chemistry, management, ecology, genetics, comparative incubation, environmental physiology, and cellular and developmental studies using wild and domestic birds as experimental animals. Both master’s degree plans, theses or comprehensive examination, are available within four categories.

Preparation. Applicants should have undergraduate preparation in a field appropriate to the course of study selected, including courses in most of the following subjects: general biology, general and developmental studies using wild and domestic entities. Compliance with Internship Approval form essential. (P/NP grading only)

Biochemistry and Molecular Biology  
(A Graduate Group)

See Biochemistry, Molecular, Cellular and Developmental Biology, on page 177; Molecular and Cellular Biology, on page 430

Biochemistry and Molecular Biology  
(A Graduate Group)

The Biochemistry and Molecular Biology program has merged with the Cell and Developmental Biology program to form Biochemistry, Molecular, Cellular, and Developmental Biology (BMCDB); see Biochemistry, Molecular, Cellular and Developmental Biology, on page 177.

Group Office. 2278 Life Sciences  
530-752-9091; http://biosci3.ucdavis.edu/GradGroups/BMCDB/

Biological Chemistry  
See Medicine, School of, on page 396.

Biochemistry, Molecular, Cellular and Developmental Biology

Mitch Singer, Ph.D., Chairperson of the Group  
530-752-9005

Group Office. 2278 Life Sciences  
530-752-9091; http://biosci3.ucdavis.edu/GradGroups/BMCDB/

Faculty  
Iannis, Adamopoulos, Ph.D., Assistant Professor  
[Medical Division of Internal Medicine]  
Jawad Al-Bassam, Ph.D., Assistant Professor  
[Medical and Cellular Biology]  
John, Albeck, Ph.D., Assistant Professor  
[Medical and Cellular Biology]  
Peter Armstrong, Ph.D., Professor  
[Medical and Cellular Biology]  
Shota Atsumi, Ph.D., Assistant Professor  
Chemistry  
Enoch Baldwin, Ph.D., Associate Professor  
[Medical and Cellular Biology]  
Peter A Beal, Ph.D., Professor  
[Medical and Cellular Biology]  
Charles Bevins, Ph.D., Professor  
[Pathology]  
Linda F. Bisson, Ph.D., Professor  
[Medical Microbiology and Immunology]  
Donald M, Bers, Ph.D., Professor  
[Pharmacology]  
Charlie Bevins, Ph.D., Professor  
[Pathology]  
Siobhan Mary, Brady, Ph.D., Assistant Professor  
[Plant Biology]  
Ann B, Britt, Ph.D., Professor  
[Plant Biology]
Biological and Agricultural Engineering

(Prepared by the Graduate Advisor)

Raul H. Piedrahita, Ph.D., Chairperson of the
Department of Biological and Agricultural Engineering

Courses in Biochemistry, Molecular, Cellular and Developmental Biology (BCB)

Graduate

290. Seminar (1)  Seminar—1 hour. Prerequisite: consent of instructor and/or graduate standing. Presentation and discussion of faculty and graduate-student research. (S/U grading only)—I, II, III (I, II, III)

298. Group Study (1-5)  Prerequisite: consent of instructor. (S/U grading only)—I, II, III (I, II, III)

299. Research (1-12)  Prerequisite: consent of instructor. (S/U grading only)—I, II, III (I, II, III)

Biological and Agricultural Engineering

(Prepared by the Graduate Advisor)

Raul H. Piedrahita, Ph.D., Chairperson of the
Department of Biological and Agricultural Engineering

Biological Sciences

(Prepared by the Graduate Advisor)

http://bae.engineering.ucdavis.edu

Faculty

Michael J. Delwiche, Ph.D., Professor
Julia Fan, Ph.D., Assistant Professor
Fadi A. Fathallah, Ph.D., Professor
D. Ken Giles, Ph.D., Professor
Mark E. Grismer, Ph.D., Professor
[Land and Water Resources]
Bruce R. Hartsough, Ph.D., Professor
Bryan M. Jenkins, Ph.D., Professor
Tina Jeoh, Ph.D., Assistant Professor
Kathryn McCarthy, Ph.D., Professor (Food Science and Technology)
Michael J. McCarthy, Ph.D., Professor
[Food Science and Technology]
[Institutes, Ph.D., Associate Professor]
Ning Pan, Ph.D., Professor (Textiles and Clothing)
Raul H. Piedrahita, Ph.D., Professor
R. Paul Singh, Ph.D., Distinguished Professor
David C. Stansby, Ph.D., Professor
Shriniwas K. Upadhyaya, Ph.D., Professor
Jean S. VanderGheynst, Ph.D., Professor
Stavros G. Vougioukas, Ph.D., Assistant Professor
Wesley W. Wellman, Ph.D., Professor
[Rand and Water Resources]
Ruihong Zhang, Ph.D., Professor

Emeriti Faculty

William J. Chancellor, Ph.D., Professor Emeritus
Pichtaw (Paul) Chen, Ph.D., Professor Emeritus
Roger E. Garrett, Ph.D., Professor Emeritus
John R. Goss, M.S., Professor Emeritus
David J. Hils, Ph.D., Professor Emeritus
John M. Krochta, Ph.D., Professor Emeritus
Miguel A. Marrioto, Ph.D., Professor Emeritus
R. Larry Mersch, Ph.D., Professor Emeritus
John A. Miles, Ph.D., Professor Emeritus
Stanley R. Morrison, Ph.D., Professor Emeritus
Richard E. Plant, Ph.D., Professor Emeritus
James W. Rumsey, M.S., Senior Lecturer Emeritus
Thomas R. Rumsey, Ph.D., Professor Emeritus
Verne H. Scott, Ph.D., Professor Emeritus
James F. Thompson, M.S., Extension Specialist Emeritus
Wesley E. Yates, M.S., Professor Emeritus

Affiliated Faculty

Dennis R. Heldman, Ph.D., Adjunct Professor
Zhongli Pan, Ph.D., Associate Adjunct Professor
Mir S. Shaffi, Ph.D., Lecturer

Major Programs and Graduate Study. For the Bachelor of Science program, see the major in Engineering: Biological and Agricultural, on page 245; for graduate study, see also Graduate Studies, on page 111.

Minor Programs. The Department of Biological and Agricultural Engineering offers two minors through the College of Agricultural and Environmental Sciences: Geographic Information Systems and Precision Agriculture.

The minor in Geographic Information Systems is open to all majors, including those in engineering. The minor is for students interested in information processing of spatial data related to remote sensing for geographical and environmental planning and related areas.

The minor in Precision Agriculture is open to all majors, including those in engineering, and acquaints students with recent developments and their applications to agriculture, in geographic information systems, global positioning systems, and variable rate technologies.

Courses. Courses are listed under Applied Biological Systems Technology and Engineering: Biological and Agricultural (Biological Systems Engineering).

Biological Sciences

(Prepared by the Graduate Advisor)

Biology Academic Success Center (BASC), 1023 Sciences Laboratory Building; 530-752-0410; http://www.biosci.ucdavis.edu/BASC

Faculty

The Biological Science major and the Bodega Marine Laboratory Spring Quarter Program are offered jointly by the departments of the college. The faculty in the college are members of the Departments of Evolution and Ecology; Microbiology; Molecular and Cellular Biology; Neurobiology; Physiology, and Behavior. Plant Biology. See each department for a list of their faculty.

The Biological Sciences Major

(Departments of Evolution and Ecology; Microbiology; Molecular and Cellular Biology; Neurobiology; Physiology, and Behavior; and Plant Biology)

The Program. The Biological Sciences major is broad in concept, spanning the numerous core disciplines of biological science. Students for Science (B.S.) program includes mathematics, general and organic chemistry, physics, and biology. While emphasizing breadth, the B.S. degree program also features an area of emphasis requirement that provides concentrated attention on one facet of biology at the upper division level. Each area of emphasis coincides with one of the departments of the college. The Bachelor of Arts (A.B.) program emphasizes biological diversity, evolution, and ecology, all built on a foundation of general and organic chemistry, physics and biology. Research and internships are encouraged in both programs.

Career Alternatives. Both degree programs prepare students for admission to graduate schools or professional schools, leading to either a variety of professional health careers or further study in basic and applied areas of research. They provide suitable preparation for careers in teaching, biological and biotechnological research with various governmental agencies or private companies, government regulatory agencies, environmental consulting, biological illustration and writing, pharmaceutical sales, biological/ environmental law, and biomedical engineering.

The A.B. degree program is also appropriate for students interested in and interested in the second school level and for careers that bear on the ecological problems that require the development of public policy.

A.B. Major Requirements:

Preparatory Subject Matter ...............................39-52

Biological Sciences 2A-2B-2C ..........................14
Chemistry 2A-2B-2C .......................................10
Chemistry 8A-8B or 118A-118B ............................6-12
Physics 1A-1B or 7A-7B-7C ...............................6-12
Statistics 12, 132, 100, or 102 .............................3-4

Recommended: Chemistry 2A and 2B

Mathematics 17A-17B or 21A-21B.......................12-17

Depth Subject Matter .................................38-42

Biological Sciences 101 .....................................4
Biological Sciences 102 or 105 ............................3
Evolution: One from Evolution and Ecology 100, 110, 115; Geology 107, 117; Plant Biology 111, 112 ........................................3-5
Ecology: One from Environmental Science and Policy 100, Evolution and Ecology 101, 107; Geology 107, 117; Plant Biology 111, 112 ........................................3-5
One course each in animal, microbial and plant diversity ..................................................8-17
Animal Diversity: Entomology 100, 107, 109; Evolution and Ecology 105, 112 and 115, 134; Nematology 110; Wildlife, Fish, and Conservation Biology 110, 111, 120
Microbial Diversity: Microbiology 101, 162; Pathology, Microbiology, and Immunology 127, 128, Plant Pathology 148; Plant Pathology 148, Soil Science 113; Plant Biology 110, 113, 114; Plant Biology 102, 108, 116, 119, 127

Additional upper division course work in biological sciences to achieve a total of 38 or more units; see "Approved Biology Electives" list below.

Upper division course work must include a total of two units or a total of six hours/week of fieldwork or laboratory work.

Note: Although a course may be listed in more than one category, that course may satisfy only one requirement.

Total units for the major ....................................77-94

B.S. Major Requirements:

Preparatory Subject Matter ...............................55-65

Biological Sciences 2A-2B-2C ..........................14
Chemistry 2A-2B-2C .......................................15
Chemistry 8A-8B or 118A-118B ............................6-12
Mathematics 17A-17B-17C or 21A-21B (2C recommended) ..................................9-12
Physics 7A-7B-7C .............................................12

Depth Subject Matter .................................49-60

Biological Sciences 101, 105 (or 102+103) ..........................104-106
Statistics 12, 132, 100, or 102 .............................3-4

Recommended: Chemistry 2A and 2B

Field Requirement, Area of Emphasis Requirement, and additional units (if necessary) to achieve a total of 49 units or more .................................................32-35

Note: Although a course may be listed in more than one category, that course may satisfy only one requirement.

Quarter Offered: Fall—Fall, Winter—Fall, Spring—Spring, Summer—Summer, 2015-2016 offering in parentheses.

Pre-Fall 2011 General Education (GE): AH—Arts and Humanities; SS—Social Sciences; SB—Science and Engineering; SC—Science and Engineering; SE—Science and Engineering; SS—Social Sciences; AG—Arts and Humanities; DD—Domestic Diversity; DL—Domestic Diversity; WE—World Cultures; WRT—Writing Experience

Fall 2011 and on Revised General Education (GE): AH—Arts and Humanities; SE—Science and Engineering; SS—Social Sciences; AG—Arts and Humanities; DD—Domestic Diversity; DL—Domestic Diversity; QC—Quantitative Skills; SL—Scientific; VL—Visual; WC—World Cultures; WE—Writing Experience