opportunities of sustainable agriculture and food systems, form multidisciplinary teams, and identify and connect with stakeholders to understand their needs and concerns. GE credit: SciEng | SE — I. (I) Tomich

191B. Workshop on Food System Sustainability (3)
Lecture — 2 hours; laboratory — 3 hours. Prerequisite: course 191A. Priority enrollment for seniors in the sustainable agriculture and food systems major; limited to 15 students per section. Continuing education 191A. Student teams conduct analyses of a specific issue in sustainable agriculture or food systems, prepare a critical assessment of technological, economic, environmental, and social dimensions of options, and present their results to stakeholders. GE credit: SciEng | SE — II. (II) Tomich

192. Internship (1-12)
Internship — 3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Work experience off and on campus in all subject areas offered in College of Agricultural and Environmental Sciences. Internships supervised by a member of the faculty. (P/NP grading only)

197T. Tutoring in Environmental Science and policy (1-3)
Tutorial — 2-6 hours. Prerequisite: upper division standing and consent of instructor. Experience in teaching under guidance of faculty member. (P/NP grading only)

198. Directed Group Study (1-5)
(P/NP grading only)

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

Graduate

212A. Environmental Policy Process (4)
Lecture — 3 hours; discussion — 1 hour. Prerequisite: course in public policy (e.g., Environmental Science and Policy 160); environmental law (e.g., Environmental Science and Policy 161); course in bureaucratic theory (e.g., Political Science 187 or Environmental Science and Policy 166); course in statistics (e.g., Sociology 106 or Agricultural and Resource Economics 106). Introduction to selected topics in the policy process, applications to the field of environmental policy. Develops critical reading skills, understanding of frameworks of the policy process and political behavior, and an ability to apply multiple frameworks to the same phenomena. Offered in alternate years. (Same course as Ecology 212A.) — III. Lubell

212B. Environmental Policy Evaluation (4)
Lecture — 1 hour; discussion — 1 hour; seminar — 2 hours. Prerequisite: intermediate microeconomics (e.g., Economics 100); Statistics 108 or Agricultural and Resource Economics 106; policy analysis (e.g., Environmental Science and Policy 160A or the equivalent); Agricultural and Resource Economics 170. Methods and practices of policy analysis; institutional and intellectual bases of policy analysis and the political role of policy analysis. Same course as Ecology 212B. Offered in alternate years. — (III) Springer

220. Tropical Ecology (3)
Lecture — 2 hours; discussion — 1 hour. Prerequisite: advanced introductory ecology course — course 100, Evolution and Ecology 101, 117; Evolution and Ecology 138 recommended. Open to graduate and undergraduate students who meet requirement subject to consent of instructor. An overview of present status of knowledge on structure and processes of major tropical ecosystems. Differences and similarities among tropical and temperate systems stressed. Offered in alternate years. — (III) Keim- kova

228. Advanced Simulation Modeling (3)
Lecture — 2 hours; discussion — 1 hour. Prerequisite: courses 128-128L, Statistics 108 or Agricultural and Resource Economics 106. Advanced techniques in model building; optimization and simulation, dynamic parameter estimation, linear models, error propagation, and sensitivity testing. Latter half of course will introduce model evaluation in ecological and social system models.

252. Sustainable Transportation Technology and Policy (3)
Lecture — 2 hours; discussion — 1 hour. Prerequisite: course 160 or the equivalent. Role of technical fixes and demand management in creating a sustainable transportation system. Emphasis on technology options, including alternative fuels, electric propulsion, and IVHS. Analysis of market demand and travel behavior, environmental impacts, economics and policy. (Same course as Civil and Environmental Engineering 252.) — III. Spieles

275. Economic Analysis of Resource and Environmental Policies (4)
Lecture/discussion — 4 hours. Prerequisite: Agricultural and Resource Economics 204/Environmental Economics 204. Development of externality theory, market failure concepts, welfare economics, theory of renewable and non-renewable resource use, and political economic models. Applications to policy issues regarding the agricultural/environment interface and managing resources in the public domain. (Same course as Agricultural and Resource Economics 275.) — III. (III)

278. Research Methods in Environmental Policy (3)
Lecture/discussion — 3 hours. Prerequisite: Agricultural and Resource Economics 106 or the equivalent. Introduction to scientific research in environmental policy. Major research designs and techniques in planning and evaluating research; statistical analysis; course in applied research methods (e.g., Sociology 106 or Agricultural and Resource Economics 106). Development of research questions and methodologies appropriate to specific policy problems. Emphasis on understanding in areas of emphasis through selected research projects.

298. Directed Group Study (1-5)
(P/NP grading only)

299. Research (1-12)
Prerequisite: graduate standing. (S/U grading only)

Environmental Sciences

See Agricultural Management and Rangeland Resources, on page 143; Atmospheric Science, on page 173; Environmental and Resource Sciences, on page 298; Environmental Biology and Management, on page 295; Environmental Horticulture and Urban Forestry, on page 297; Environmental Policy Analysis and Planning, on page 297; Environmental Toxicology, on page 303; Hydrology, on page 348; Landscape Architecture, on page 365; Soil and Water Science, on page 511; and Wildlife, Fish, and Conservation Biology, on page 544.

Environmental Toxicology

[College of Agricultural and Environmental Sciences]
Ronald S. Tijerdena, Ph.D., Chairperson of the Department
Office, 530-752-1142; http://envxtox.ucdavis.edu
Environmental Toxicology

and aquatic toxicology. The second category includes forensic science, environmental policy and management. A third category includes pharmacology, biotechnology, medicine, veterinary medicine, and food toxicology. Students are encouraged to select course work from these specialties and beyond to match their interests.

Internships and Career Alternatives. Occupations that use environmental toxicology include risk assessment, pharmaceutical development, food additive toxicity testing, managing regulatory compliance, regulatory testing for forensic analysis, pest control, monitoring and field sampling, industrial hygiene, and environmental health and safety. A substantial proportion of graduates elect to pursue advanced training in graduate or professional schools. Others with the B.S. degree have gone on to medical, pharmacy, or veterinary medical school, as well as to graduate degrees in pharmacology, toxicology, agricultural and environmental chemistry, or public health. During undergraduate study, optional internships or research projects are recommended to provide training and work experience to help students pursue future goals.

B.S. Major Requirements:

<table>
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<th>UNITS</th>
<th>Description</th>
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<tbody>
<tr>
<td>72-73</td>
<td>Preparatory Subject Matter</td>
</tr>
<tr>
<td>14-15</td>
<td>Biological Sciences 2A, 2B, 2C</td>
</tr>
</tbody>
</table>

Note: Students transferring from community college with the equivalent of the Biological Sciences 1 series would receive credit on a case-by-case basis.


Mathematics 12B-17B...

Physics 7A-7B-7C...

Statistics 100, 102, 103, 104, 106, or 108...

Upper Division Writing, University Writing Program 101 or 104A...

Preferably, the course should be taken prior to enrollment in Environmental Toxicology 102B and 103B.

Satisfaction of the General Education requirement to include courses selected with advisor’s approval to complement the major; courses in agricultural economics, environmental studies, political science, psychology, and sociology are particularly recommended.

Depth Subject Matter

<table>
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<th>UNITS</th>
<th>Description</th>
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</table>
| 37-47 | Biological Sciences 101 and 102 or 102 and 103...
| 1-2 | Enzymology 102A-102B-1028, 103A-103B and three upper division |
| 12 | Environmental Toxicology classes chosen from the following list: 104, 120, 127, 128, 130, 131, 135, 138, and 146...

Restricted Electives

<table>
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<tr>
<th>UNITS</th>
<th>Description</th>
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<tr>
<td>24-26</td>
<td>Electives selected for area of specialization/ emphasis with faculty advisor’s approval with 6 units combined maximum of 190, 192, 198, and 199 with advisor approval; see department website for details.</td>
</tr>
</tbody>
</table>

Total Units for the Major

<table>
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<th>UNITS</th>
<th>Description</th>
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<tbody>
<tr>
<td>133-146</td>
<td>Major Adviser, Takayuki Shibamoto</td>
</tr>
</tbody>
</table>

Advising Center for the major is in 4111 Meyer Hall. Contact the Academic Program Adviser at 530-752-1042.

Minor Program Requirements:

<table>
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<th>UNITS</th>
<th>Description</th>
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</table>
| 128-130-131-135-138-146 | Environmental Toxicology 104, 120, 127, 128, 130, 131, 135, 138, and 146...

Minor Adviser. M.S. Denison

Graduate Study. Programs of study leading to M.S. and Ph.D. degrees through related graduate groups such as Pharmacology and Toxicology, Biochemistry, Molecular, Cellular, and Developmental Biology, Agricultural and Environmental Chemistry, and Master’s Degree Program. For information on graduate study, contact the Advising Office or the appropriate graduate adviser; see Graduate Studies, on page 111.

Courses in Environmental Toxicology (ETY)

Lower Division


20. Introduction to Forensic Science (3) Lecture—3 hours. Basic principles of forensic science, types of information on which investigations focus, how information is obtained and used in criminal investigations, types of scientific skills required to practice forensic science, and training. Real cases discussed; demonstrations of methods provided. GE credit: SciEng, Wrt | SE, SL—II. (II.) Kanthasamy

30. Chemical and Drug Use and Abuse (3) Lecture—3 hours. An overview of chemical use and abuse in our society. The effects of chemicals (therapeutic drugs, pesticides, food additives, herbal remedies, environmental contaminants, and recreational drugs) on humans and other biota are discussed. GE credit: SciEng | SE—II. (III.) Wood

92. Internship (1-12) Internship—3-36 hours. Prerequisite: lower division standing and consent of instructor. Work experience off and on campus in all subject areas offered in the College of Agricultural and Environmental Sciences. Internships supervised by a member of the faculty. (P/NP grading only.) GE credit: SE.

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

Upper Division

101. Principles of Environmental Toxicology (4) Lecture—3 hours; discussion—1 hour. Prerequisite: Chemistry 118B, or 128B and Biological Sciences 1A. Principles of toxicology with a focus on environmental, industrial, and natural chemicals. Topics include fate and effects of chemicals in organisms and the environment, air pollutants, insecticides, aquatic toxicology, endocrine disruptors, biomarkers and bioassays, and risk assessment. GE credit: SciEng | SE, SL—I. (I.) Denison

102A. Environmental Fate of Toxicants (4) Lecture—3 hours; discussion—1 hour. Prerequisite: Chemistry 118B, or 128B and Biological Sciences 1A. Principles of toxicology with a focus on environmental, industrial, and natural chemicals. Properties of toxic chemicals influencing their distribution and transformations; action of environmental factors affecting toxicant breakdown, movement, and accumulation; sources and concentration of major classes of environmental toxicants. Not open for credit to students who have completed course 112A. GE credit: SciEng | QL, SE, SL, VL, WE—I. (II.) Tierendes

102B. Quantitative Analysis of Environmental Toxicants (5) Lecture—3 hours; laboratory—3 hours; discussion—1 hour. Prerequisite: course 102A. Sample preparation methods for trace analysis of environmental toxicants. Concept and techniques of advanced analytical instrumentation. Interpretation and use of analytical data. Not open for credit to students who have completed course 112B. GE credit: SciEng | SE, VL, WE—III. (III.) Gaikwad, Mitchell, Shibamoto

103A. Biological Effects of Toxicants (4) Lecture—3 hours; discussion—1 hour. Prerequisite: Biological Sciences 102; course 101 and Neurobiology, Physiology, and Behavior 101 recommended. Biological effects of toxic substances in living organisms. Metabolism, cellular and tissue targets, mechanisms of action, and pathological effects. Not open for credit to students who have completed course 114A. GE credit: SciEng | QL, SE, SL, VL, WE—III. (III.) Wood

103B. Biological Effects of Toxicants: Experimental Approaches (5) Lecture—3 hours; laboratory—3 hours; discussion—1 hour. Prerequisite: course 103A. Experimental approaches for assessing the biological effects of toxicants. Not open for credit to students who have completed course 114B. GE credit: SciEng | SE, VL, WE—III. (III.) Wood

104. Environmental and Nutritional Factors in Cellular Regulation and Nutritional Toxicants (4) Lecture—3 hours; discussion—1 hour. Prerequisite: Biological Sciences 101; Biological Sciences 103 or Animal Biology 103. Cellular regulation from nutritional/toxicalogical perspective. Emphasis: role of biofactors on modulation of signal transduction pathways, role of specific organelles in organization, regulation of metabolic transformation, molecular biofactors, molecular biofactors, functions of pharmacology/toxicology important to understanding nutrient/toxicant metabolism. [Same course as Nutrition 104.] GE credit: SciEng | QL, SE, SL—I. (I.) Haj, Oteiza

110. Toxic Tragedies and Their Impact on Society (2) Lecture—2 hours. Prerequisite: Biological Sciences 10 or the equivalent or consent of instructor; Chemistry 118B recommended. Examination of toxic tragedies, their origins, consequences, and effects on toxic regulation. GE credit: SciEng, Wrt | OL, SE, SL, WE—I. (II.) Rice

111. Introduction to Mass Spectrometry (3) Lecture—3 hours. Prerequisite: Chemistry 11BC. Introduction to mass spectrometry, including ionization techniques, mass analyzers, interpretation of mass spectra, and applications of mass spectrometry. Emphasis on fundamental concepts of mass spectrometry necessary to identify and quantify organic molecules. GE credit: SciEng | SE

120. Perspectives in Aquatic Toxicology (4) Lecture—3 hours; discussion—1 hour. Prerequisite: Chemistry 118B, 128B or 128B and Biological Sciences 1A, or consent of instructor. Toxic substances, their fate in marine and freshwater systems, and their effects on aquatic organisms, populations, and ecosystems. Emphasis on issues of current concern. Offered in alternate years. GE credit: SciEng | QL, SE, SL, VL, WE—I. (II.) Cherr, Tjeerdema, Whitehead

127. Environmental Stress and Developmental Toxicity in Marine Organisms (10) Lecture—4 hours; laboratory—12 hours; discussion—2 hours. Prerequisite: course 101 or Biological Sciences 102 or 104 or the equivalent; course 114A or Nutrition 114 recommended. Course taught at Bodega Marine Laboratory. Effects of environmental and nutritional stress, including pollutants, on development and function in embryos and larvae of marine organisms. Emphasis on experimental methods. (Same course as Nutrition 127.) GE credit: SciEng | QL, QL, SE, SL, VL, WE—I. (II.) Denison

128. Food Toxicology (3) Lecture—3 hours. Prerequisite: Biological Sciences 102 and 103. Chemistry and biochemistry of toxins occurring in foods, including plant and animal toxins, intentional and unintentional food additives. The assessment of food safety. [Same course as Food Science and Technology 128.] GE credit: SciEng | SE—III. (III) Gaikwad, Mitchell, Shibamoto

Quarter Offered: F—Fall, W—Winter, S—Spring, V—Summer. 2015-2016 offering in parentheses.
130. The Role and Applications of Toxicology in Modern Industry (3)
Lecture—3 hours. Prerequisite: course 101 required; course 114A recommended. Role of toxicology in industry research and development, human health and environmental protection, hazard and risk evaluations, risk management, and communications. Product stewardship, and regulatory compliance. Scientific principles and methods of toxicology in chemical, energy, pharmaceutical, pesticide, biotechnology industries. GE credit: SciEng | QL, SE, SL, VL, WE.—Ill. (III.) Wong

131. Environmental Toxicology of Air Pollutants (3)
Lecture—3 hours. Prerequisite: Chemistry 88 (may be taken concurrently or the equivalent). Biochemical Sciences 120 recommended. Field trip required. Toxicology of air pollutants. The ambient, indoor, and occupational environments. Health effects, sources, environmental fates, pulmonary responses, sampling and analyses, and air quality criteria and standards. GE credit: SciEng | QL, SE, SL, VL, WE.—Ill. (III.) Marty

135. Health Risk Assessment of Toxicants (3)
Lecture—3 hours. Prerequisite: course 101; course 114A recommended. Current practices of health risk assessment of environmental chemicals using toxicological principles and their application to regulatory control of these chemicals. GE credit: SciEng | QL, SE, SL, VL, WE.—Ill. (III.) Kado

138. Legal Aspects of Environmental Toxicology (3)
Lecture—3 hours. Prerequisite: course 10 or 101 recommended. Federal and California legislation concerning air and water pollution, pesticide use, food and feed additives, consumer protection, and occupational exposure to toxic substances; roles of federal and state regulatory agencies; alternatives to government control. GE credit: SciEng | SE, VL, WE.—II. (II.) Alexeff

146. Exposure and Dose Assessment (3)
Lecture—3 hours. Prerequisite: course 112A; course 135 recommended. The exposure component of risk assessment: air and water pollution, pesticide use, food and feed additives, consumer protection, and occupational exposure to toxic substances; roles of federal and state regulatory agencies; alternatives to government control. GE credit: SciEng | SE, VL, WE.—II. (II.) Alexeff

190. Seminar (1)
Seminar—1 hour. Prerequisite: consent of instructor. Selected topics presented by students, faculty, or outside experts covering current research and instructional activities within environmental toxicology. Reports and discussion concerning oral and written presentations, literature sources, and career opportunities. P/N credit: SciEng | SE, VL, WE.—Ill. (III.) Bennett

190C. Research Group Conference (1)
Discussion—1 hour. Prerequisite: consent of instructor. Weekly conference of advanced research methods and the interpretation of research results. P/N credit: SciEng | SE, VL, WE.—Ill. (III.)

190S. Environmental Toxicology Career Seminar (1)
Seminar—1 hour. Careers in environmental toxicology: discussions with graduates from the Department of Environmental Toxicology and other experts in the field. P/N grading only. GE credit: SE.—I, II, III, (I, II, III)

192. Internship (1-12)
Internship—3-36 hours. Prerequisite: completion of 84 units and consent of director. Work experience off and on campus in all subject areas offered in the College of Agricultural and Environmental Sciences. Internships supervised by a member of the faculty. P/N grading only. GE credit: SE.—I, II, III, (I, II, III)

194HA-194HB. Honors Research (3-3)
Discussion—1 hour; laboratory—6 hours. Prerequisite: senior standing, minimum GPA of 3.250, consent of instructor. Specific research project conducted under the supervision of a faculty sponsor. Experience to include experimental design, learning new techniques, data analysis and interpretation of findings. P/N grading only; deferred grading standing completion of sequence. GE credit: SE.

194HC. Honors Research (3)
Laboratory—6-9 hours; discussion—1 hour. Prerequisite: senior standing, minimum GPA of 3.250; and consent of instructor. 194HA-194HB. P/N grading only. GE credit: SE.

197T. Tutoring in Environmental Toxicology (1-5)
Hours and duties will vary depending upon course being tutored. Prerequisite: advanced standing in Environmental Toxicology, a related major, or the equivalent experience and consent of instructor. Teaching toxicology including conducting discussion groups, regular departmental courses under direct guidance of staff. May be repeated for credit up to a total of 5 units. P/N grading only. GE credit: SE.

198. Directed Group Study (1-5)
P/N grading only. GE credit: SE.

199. Special Study for Advanced Undergraduates (1-5)
P/N grading only. GE credit: SE.

Graduate

203. Environmental Toxicants (4)
Lecture—3 hours; discussion—1 hour. Prerequisite: Chemistry 128C (or the equivalent), or Chemistry 88 and consent of instructor. Selected topics illustrating their occurrence, structure, and the reactions underlying detection, toxicity, fate, and ecological importance. Offered in alternate years. —II. Beck, Sebbe

214. Mechanisms of Toxic Action (3)
Lecture—3 hours. Prerequisite: Biological Sciences 102, 103, and consent of instructor. Chemical, biochemical, and molecular mechanisms underlying the adverse effects of toxicants. Students are required to write a grant proposal and participate in a grant review panel. Offered in alternate years. —II. Denison, Hammock

220. Analytical Toxicants (3)
Lecture—3 hours. Prerequisite: coursework in organic chemistry. Principles of microanalysis of toxicants. Theoretical considerations regarding separation, detection and quantitative determination of toxicants using chemical and instrumental techniques. (Same course as Forensic Science 220).—I. (I.) Zhang

220L. Analysis of Toxicants Laboratory (2)
Laboratory—6 hours. Prerequisite: course 220 (may be taken concurrently or the equivalent). Laboratory techniques for microanalysis of toxicants. Separation, detection, and quantitative determinations of toxicants using chemical and instrumental methods. —II. (II.)

228. Gas Chromatography/Mass Spectrometry of Toxic Chemicals (3)
Lecture—1 hour; discussion—1 hour; laboratory—3 hours. Prerequisite: course 220 and Chemistry 129C; or consent of instructor. Application of GC/MS techniques to toxic chemical analysis. Mass spectral fragmentations and their application to the structural elucidation. Practical application of GC/MS in current research. Preference given to environmental toxicology graduate students. Offered in alternate years. —III. (III.) Holstge

234. Current Topics in Neurotoxicology (3)
Lecture—3 hours. Prerequisite: core courses in one of the following graduate programs: Pharmacology and Toxicology, Agricultural and Environmental Chemistry, Biochemistry and Molecular Biology, Cell and Developmental Biology, Immunology, Molecular Cellular and Developmental Biology, Environmental Toxicology, and Neuroscience. Restricted to upper level graduate students. Must obtain permission from the course coordinator. General principles of neurotoxicology, the cell and molecular mechanisms of neurotoxicity, and health impacts of specific neurotoxants and the contribution of neurotoxic compounds to complex neurodegenerative disorders and neurodegenerative diseases. (Same course as Environmental Sciences 234 and Molecular, Cellular, and Integrative Physiology 234.)—III. (III.) Lein

240. Ecotoxicology (3)
Lecture—3 hours. Prerequisite: elementary course in toxicology and ecology or equivalent, or consent of instructor. Principles of toxicology as applied to chemical action on natural populations, communities, and ecosystems. Physical, chemical, and biological characteristics which make certain toxicants toxic, effects, modeling, and field research. Selected case histories are analyzed and presented in class.—III. (III.) Whitehead

250. Reproductive Toxicology (3)
Lecture—3 hours; lecture/discussion—1.5 hours. Prerequisite: Pharmacology 220 or Pharmacology—Toxicology 203. Application of toxicological principles in reproductive studies. Effects of toxicants on the male, female, and developing embryo/fetus. Critical evaluation of reproductive toxicology studies and development of mechanistic approaches to understanding how chemical exposure can adversely affect reproduction. Offered in alternate years.—II. Cherr, Golub

260. Immunotoxicology (3)
Lecture—3 hours. Prerequisite: undergraduate or graduate introduction to immunology coursework recommended, but not required. Immunology of the following graduate programs: Pharmacology and Developmental Biology, Immunology, Molecu lar and Developmental Biology, Immunology, and Immunology of Environmental Toxicology or the equivalent, or consent of instructor; graduate standing. Classification and chemical properties of pesticides, their mode of action, metabolism and disposition, pesticide resistance, effects on human health and ecology and methods of risk benefit analyses. Offered in alternate years. —Golub

270. Toxicology of Pesticides (3)
Lecture—3 hours. Prerequisite: one course each in (a) Organic Chemistry, (b) Biochemistry, (c) Toxicology (course 101 or equivalent), or consent of instructor; graduate standing. Classification and chemical properties of pesticides, their mode of action, metabolism and disposition, pesticide resistance, effects on human health and ecology and methods of risk benefit analyses. Offered in alternate years. —Golub

278. Molecular Techniques (3)
Lecture—3 hours. Prerequisite: graduate standing or consent of instructor. Recombinant DNA technology and its applications. (Same course as Forensic Science 278.) Offered in alternate years. —II. (II.)

280. Forensic DNA Analysis (3)
Lecture—3 hours. Prerequisite: coursework in genetics and molecular biology, and knowledge of theory and practice of forensic DNA analysis; past, present, and emerging technologies; legal and quality assurance issues. DNA extraction, DNA quantitation, multiple amplification of STR loci, and methods of risk benefit analyses. Offered in alternate years. —II. (II.)

281. Principles and Practice of Forensic Serology and DNA Diagnosis (3)
Lecture—2 hours; lecture/discussion—3 hours. Prerequisite: Forensics/course 278 or Forensics/course 280, or equivalent; consent of instructor. Restricted to students enrolled in the M.S. in Forensic Science Program or by consent of Forensic Science Program Director. Comprehensive overview of forensic serology and DNA typing techniques and technologies. Strong emphasis on real-world application standing including preservation and tracking of biological evidence, detection and identification of bodily fluids, and methods to extract, quantify, and type human DNA. (Same course as Forensic Science 281.)—II. (II.)

284. Non-Human Forensic DNA—Theory and Casework Application (2)
Lecture—2 hours. Prerequisite: consent of instructor required for all students not enrolled in the M.S. Forensics program; upper division Molecular Biology and Genetics or equivalent. Restricted to graduate standing. Provides a comprehensive understanding of plant and animal forensic biology in terms of sam-
Epidemiology

See Medicine and Epidemiology (VME), on page 339.

Epidemiology (A Graduate Group)

David R. Gibson, Ph.D., Chairperson of the Group

Group Office. 5215 VM3A
530-752-2657, Fax 530-754-0225
http://www.epi.ucdavis.edu

Faculty

Sharif Aly, D.V.M., M.P.V.M., Ph.D., Assistant Professor (Population Health and Reproduction) E. Robert Avioli, D.V.M., Ph.D., Professor (Population Health and Reproduction) Rahman Azari, Ph.D., Lecturer (Statistics) Hsingiung Bang, Ph.D., Associate Professor (Public Health Sciences) Christopher M. Barker, Ph.D. (Center for Vectorborne Diseases) Laurel A. Beckett, Ph.D., Professor (Public Health Sciences) Deborah Bennett, Associate Professor (Department of Public Health Sciences) Walter Boyce, D.V.M., Ph.D., Professor (Population Health and Reproduction) Kenneth Brown, M.D., Professor (Nutrition) Diana Cassady, Dr.P.H., Associate Professor (Department of Public Health Sciences) Munasinghe Chiperwe, M.P.H., Ph.D., Assistant Professor (Medicine and Epidemiology) Bruno Chomel, D.V.M., Ph.D., Professor (Population Health and Reproduction) Patrick Coggeshall, D.V.M., Ph.D., Professor (Vaccinology, Microbiology, and Immunology) Rosemary Cress, Ph.D., Associate Professor (Public Health Sciences) Beate Crossley, Ph.D., Associate Professor (California Animal Health and Food Safety Laboratory) Kathryn DeRieffer, Ph.D., Associate Professor (Public Health Sciences) Larien Dalrymple, M.D., M.P.H., Assistant Professor (Internal Medicine) Kathryn Dewey, Ph.D., Professor (Nutrition) Christiana Drake, Ph.D., Professor (Statistics) Jonathan Ducore, M.D., Ph.D., Professor (Pediatrics) Holly Ernest, D.V.M., M.P.H., Associate Professor (Population Health & Reproduction) Thomas B. Farver, Ph.D., Professor (Population Health and Reproduction) Janet Foley, M.S., Ph.D., Emeritus (Veterinary Disease & Public Health) Estella Geraghty, M.D., M.S., M.P.H., Assistant Professor (Internal Medicine) David R. Gibson, Ph.D., Professor (Public Health Sciences) Ellen Gold, Ph.D., Professor (Public Health Sciences) Lynette Hart, Ph.D., Professor (Population Health and Reproduction) Danielle Harvey, Ph.D., Associate Professor (Public Health Sciences) Ira Hertz-Picciotto, Ph.D., Professor (Public Health Sciences) Ashley Hill, D.V.M., M.P.V.M., Ph.D., Assistant Professor (California Animal Health and Food Safety Laboratory) Martin Hoffmann, M.D., Professor (Physical Medicine and Rehabilitation) Ana-Maria Isail, Ph.D., Associate Professor (Public Health Sciences) Jeong Kim, Ph.D., Professor (Department of Public Health Sciences) Richard L. Kravitz, M.D., Professor (Internal Medicine) Christine Kreader-Johnson, Ph.D., Associate Professor (Wildlife Health Center) Michele A. LaMerrill, MPH, Ph.D., Assistant Professor (Environmental Toxicology) Paul Leigh, Ph.D., Professor (Department of Public Health Sciences) Ching-Shang Li, Ph.D., Professor (Public Health Sciences) James Marcini, M.D., M.P.H., Professor (Pediatrics) Beatriz Martinez Lopez, D.V.M., M.P.V.M., Ph.D., Assistant Professor (Medicine and Epidemiology) Anna Mazel, Professor, Ph.D. (Wildlife Health Center) Stephen McMurtry, M.D., Professor (Department of Public Health Sciences) Joy Melnikow, M.D., M.P.H., Professor (Family and Community Medicine) Diana L. Miglioretti, Ph.D., Professor (Public Health Sciences) William Reisen, Ph.D., Professor (Center for Vectorborne Diseases) Lyngu Kim, Ph.D., Associate Professor (Department of Public Health Sciences) Joanne Reisen, M.D., M.P.H., Professor (Internal Medicine) David M. Rocke, Ph.D., Professor (Department of Public Health Sciences) Patrick Romano, M.D., M.P.H., Professor (Internal Medicine) Joan Dean Rowe, M.P.V.M., D.V.M., Ph.D., Associate Professor (Population Health and Reproduction) Christian Sandrock, M.D., M.P.H., Associate Professor (Internal Medicine) Marc Schenker, M.D., Ph.D., Professor (Public Health Sciences) Thomas Scott, Ph.D., Professor (Epidemiology) Woutra Smith, D.V.M., M.P.H., Ph.D., Associate Professor (Pathology, Microbiology and Immunology) Christine Stewart, M.P.H., Ph.D., Assistant Professor (Department of Nutrition) Robert Szabo, M.D., Professor (Orthopedic Surgery)

Daniel Tancredi, Ph.D., Assistant Professor (Pediatrics) Xiaowei Yang, Ph.D., Assistant Professor (Department of Public Health Sciences) Michael Ziccardi, Ph.D. (Wildlife Health Center)

Graduate Faculty


Graduate Study. The Graduate Group in Epidemiology offers programs of study and research leading to the M.S. and Ph.D. degrees. Areas of emphasis include environmental/occupational epidemiology; infectious disease epidemiology; zoonotic and vector-borne diseases; epidemiologic methods and biostatistics; health services and health economics; nutritional epidemiology; reproductive, perinatal, developmental and pediatric epidemiology; wildlife epidemiology; and social and behavioral epidemiology. For detailed information regarding the program, please consult the chairperson of the group or see the website.

Graduate Advisers. Janet Foley (Medicine and Epidemiology), Lihong Qi (Public Health Sciences), and William Reisen (Center for Vectorborne Diseases)

Required Courses for the Program

Prerequisite Courses. Prerequisites may be taken concurrently with required and courses below.

Mathematics 16A-16B or 21A-21B
Statistics 102, 106, and 108, or Preventive Veterinary Medicine 402, 403

Required Courses. These courses are required of all students in the program; M.S. and Ph.D. degrees. These requirements cannot be waived and must be met before a student’s Qualifying Examination.

Epidemiology 202, 203, 204, 205, 206, 207, 208 and 290
One course from: Population Health and Reproduction 202 or Statistics 204
Related Courses. For additional course work in Epidemiology, please see Medicine and Epidemiology, Preventive Veterinary Medicine, Population Health and Reproduction, Public Health Sciences, and Statistics.

Courses in Epidemiology (EPI)

Graduate

202. Quantitative Epidemiology I: Probability (5)
Lecture—4 hours, laboratory—2 hours. Prerequisite: Mathematics 16A or 17A or 21A or equivalent; Statistics 102 and 108 or Population Health and Reproduction 402 or 403 or equivalent; concurrent or previous enrollment in a basic epidemiology course (e.g., course 205). Foundations in probability for epidemiologists. Emphasis on properties of and relationships between distributions and application of probability concepts to epidemiology. Includes a mathematical skills laboratory to assist in solution of epidemiologic problems.

203. Quantitative Epidemiology II: Statistical Inference (4)
Lecture—3 hours, laboratory/discussion—1 hour. Prerequisite: course 202, or Statistics 130A, or 131A, or 133; basic course in Epidemiology 205 or equivalent. Provides the mathematical foundations for statistical models, methods, and data analysis.