92. Internship (1-12)
Internship—3–36 hours. Prerequisite: lower division standing and consent of instructor. Work experience off and on campus in resource sciences. Internship supervised by a member of the faculty. (P/NP grading only.) May be repeated for credit.—I, II, III, (I, II, III.)

98. Directed Group Study (1-5)
Prerequisite: consent of instructor. Primarily for lower division students. May be repeated for credit. (P/NP grading only.)—I, II, III, (I, II, III.)

99. Special Study for Undergraduates (1-5)
Prerequisite: consent of instructor. Primarily for lower division students. May be repeated for credit. (P/NP grading only.)—I, II, III, (I, II, III.)

Upper Division

100. Principles of Hydrologic Science (4)
Lecture—2 hours. Prerequisite: Chemistry 2B, Mathematics 16A, 16B, 17A, or 9A. Topics include hydrology (surface and ground water), hydraulic flow through porous media, water in the soil-plant-atmosphere continuum, water quality, flow through open channels, contaminant and water-resource problems. Not open to students who have successfully completed Environmental and Resource Sciences 100 or formerly Environmental and Resource Sciences 101. GE credit: SciEng | QL, SE, SL.—I, II, III, (I, II, III.)

108. Environmental Monitoring (3)
Lecture/discussion—2 hours; laboratory—2 hours; fieldwork. Prerequisite: entrance level course work in student’s major; specifically, Evolution and Ecology 101 (Evolution and Ecology), Environmental Science and Policy 100 (Environmental Biology and Management), Environmental Toxicology 102 (Environmental Toxicology), Wildlife, Fish, and Conservation Biology 100 (Wildlife, Fish, and Conservation Biology), Environmental and Resource Sciences 100 (Hydrologic Science), Soil Science 100 (Soil Science, Environmental Horticulture 100 (Environmental Horticulture and Urban Forestry), Landscape Architecture 50 (Landscape Architecture) or the equivalent for any of these courses. Instrumentation and methods for environmental monitoring GPS, sensors, datalogging, and GIS. Wide range of measurement techniques for environmental parameters. Not open to students who have successfully completed Environmental and Resource Sciences 108. (Formerly Environmental and Resource Sciences 108.) GE credit: SciEng | QL, SE, SL.—III, (I, II, III.)

120. Global Environmental Interactions (4)
Lecture—3 hours; discussion—1 hour. Prerequisite: one college level chemistry course, one college level biology course. Limited to 25 students per discussion section. Relationships among climate, hydrology, biogeochemical cycles, soils and vegetation distribution in diverse landscapes and biomes. Emphasis on physical, chemical, and biological processes affecting ecosystems from the poles to the equator, and human impacts on the environment. Not open to students who have successfully completed Environmental Resources Sciences 60 or 120. (Formerly Environmental Resources Sciences 60 and 120.)—I, II, III, (I, II, III.)

121. Water Science and Management (3)
Lecture—2 hours; discussion—1 hour. Prerequisite: Physics 10 or Geology 1. Role of water as an essential natural resource in contemporary society. Aspects of water, including descriptions of natural phenomena and underlying physical causes. Water for cities, agriculture, industry, wildlife and recreation; case studies of water management. Not open to students who have successfully completed Environmental and Resource Sciences 121. (Formerly Environmental and Resource Sciences 121.) GE credit: SciEng | QL, SE, SL.—I, II, III, (I, II, III.)

131. Air as a Resource (3)
Lecture—2 hours; discussion—1 hour. Prerequisite: Chemistry 10. Degradation of the atmospheric resource, historical aspects and effects of air pollution examined. Emphasis on primary and particulate pollutants and discussion of their impact. Not open to students who have successfully completed Environmental and Resource Sciences 131. (Formerly Environmental and Resource Sciences 131.) GE credit: QL, SE, SL.—II, (II, III.)

141. Role of Fire in Natural Ecosystems (4)
Lecture—3 hours; term paper. Prerequisite: basic biological concepts: Botany 2A or Plant Biology 2; ecology/evolution: Biological Sciences 2B or 2C. Fire regimes and roles in major North American vegetation types, especially in the west. Physics of fire, fire effects on organisms and ecosystems functioning, threats to ecosystems, fire in resource management, and fire use by indigenous people. Not open to students who have successfully completed Environmental and Resource Sciences 141. (Formerly Environmental and Resource Sciences 141.) GE credit: SciEng | QL, SE, SL.—III, (I, II, III.)

144. Trees and Forests (4)
Lecture—3 hours; discussion—1 hour. Prerequisite: Plant Sciences 2 or Plant Sciences 1C or 2C. Biological structure and function of trees as organisms; understanding of forests as communities and as ecosystems; use of forests by humans; tree phytology, photosynthesis, respiration, soil processes, life histories, dormancy, forest biodiversity, and agroforestry. [Same course as Plant Sciences 144.] Not open for credit to students who have completed Plant Biology 144 or Environmental and Resource Sciences 144. (Formerly Plant Biology/Environmental Horticulture/Environmental and Resource Sciences 144.) GE credit: SciEng | QL, SE, SL.—I, II, (I, II, III.)

185. Aerial Photo Interpretation and Remote Sensing (4)
Lecture—2 hours; laboratory—4 hours. Prerequisite: upper division standing. Basics of remote sensing and photogrammetry. Satellite, grids, and map projections, aerial photo interpretation, sensors and platforms for aerial and space photography and non-photographic imaging systems, aerial thermography, microwave sensing, and introduction to remote sensing applications. Not open to students who have successfully completed Environmental Resource Science 185. (Formerly Environmental Resource Science 185.)—I, II, III, (I, II, III.)

186. Environmental Remote Sensing (5)
Lecture—3 hours; laboratory—6 hours. Prerequisites: Mathematics 16B and Physics 7C or 7B; upper division standing; Landscape Architecture 150 recommended. Overview of satellite, airborne, and ground-based remote sensing, building on properties of electromagnetic radiation. Applications include hydrologic processes, weather and climate, ecology and land use, soils, geology, forestry, and agriculture. Computer based analysis and visualization of images and processing techniques. Not open to students who have successfully completed Hydrologic Science 186 or Environmental and Resource Sciences 186. (Formerly Hydrologic Science 186 and formerly Environmental and Resource Sciences 186.) GE credit: SciEng | QL, SE, SL.—II, III, (I, II, III.)

192. Internship (1-12)
Internship—3–36 hours. Prerequisite: completion of 84 units; consent of instructor. Work experience off and on campus in resource sciences. Internship supervised by a member of the faculty. (P/NP grading only.)—I, II, III, (III, (II, III.)

194H. Senior Honor Thesis (2-6)
Independent study—2-6 hours. Prerequisite: senior standing, overall GPA of 3.50 or higher and consent of master adviser. Independent study, guided research on an environmentally related subject of special interest to the student. GE credit: SciEng | QL, SE, SL.—I, II, III, (I, II, III.)

195. Integrating Environmental Science and Management (2)
Lecture/discussion—2 hours. Prerequisite: senior status in Environmental Science and Management major or other environmental science major (e.g. Environmental Resource Science, Environmental Biology and Management; Environmental Toxicology; Environmental Policy Analysis and Planning, Wildlife, Fish, and Conservation Biology, Hydrologic Science.), consent of instructor. Practical aspects of environmental improvement through integrated analyses of contemporary issues or problems associated with advocacy, regulation, science and resource management from the perspectives of the physical and ecological sciences and current policy/management. May be repeated two times for credit. GE credit: SciEng or SocSci | SS or SE.—II, (II, III.)

98. Directed Group Study (1-5)
Prerequisite: consent of instructor. (P/NP grading only.)—I, II, III, (I, II, III.)

99. Special Study for Advanced Undergraduates (1-5)
Prerequisite: consent of instructor. (P/NP grading only.)—I, II, III, (I, II, III.)

Environmental Science and Policy

(College of Agricultural and Environmental Sciences)

Sandy Handy, Ph.D., Chairperson of the Department

Marcel Hoolock, Ph.D., Vice Chairperson

Mark N. Lubell, Ph.D., Vice Chairperson

Department Office. 2132 Wickson Hall 530-752-3026

Faculty

Gwendolyn B. Arnold, Ph.D., Assistant Professor

Marissa L. Baskett, Ph.D., Associate Professor

Edwin D. Grasholz, Ph.D., Professor, Specialist in Cooperative Extension

Susan L. Handy, Ph.D., Professor

Susan P. Harrison, Ph.D., Professor

Alan M. Hastings, Ph.D., Distinguished Professor

Robert Hjimans, Ph.D., Associate Professor

Marcel Hoolock, Ph.D., Professor

John L. Largier, Ph.D., Professor

Chevy C. Lin, Ph.D., Associate Professor

Evelina S. McKee, Ph.D., Professor

Mark N. Lubell, Ph.D., Professor

Steven G. Morgan, Ph.D., Professor

Joan M. Ogden, Ph.D., Professor

James F. Quinn, Ph.D., Professor

Elska Rejmakova, Ph.D., Professor

James N. Sanchirico, Ph.D., Professor

Mark W. Schwartz, Ph.D., Professor

Academic Senate Distinguished Teaching Award

Andrew Sih, Ph.D., Professor

Daniel Speiling, Ph.D., Professor (Environmental Science and Policy, Civil and Environmental Engineering)

Michael Springborn, Ph.D., Assistant Professor

Thomas F. Tomich, Ph.D., Professor

Food Science and Policy, Human and Community Development

Emeriti Faculty

Howard V. Cornell, Ph.D., Professor Emeritus

Charles R. Goldman, Ph.D., Professor Emeritus

Distinguished Graduate Mentoring Award

Robert A. Johnston, M.S., Professor Emeritus

Benjamin S. Orlove, Ph.D., Professor Emeritus

Seaymour I. Schwartz, Ph.D., Professor Emeritus

Academic Senate Distinguished Teaching Award

Peter J. Richerson, Ph.D., Professor Emeritus

Quarter Offered: I-Fall, II-Winter, III-Spring, IV-Summer; 2015-2016 offering in parentheses
1. Environmental Analysis (9)

(a) Environmental Science

101. Principles of Environmental Science (4)

Lecture—3 hours; discussion—1 hour. Prerequisite: Anthropology 106. (Same course as Anthropology 106.) GE credit: SciEng | SE, SL.—IV. (IV.) McClain

111. Marine Environmental Issues (1)

Discussion—1 hour; seminar—2 hours. Prerequisite: upper division standing or consent of instructor; concurrent enrollment in at least one course from courses 124, 152, Evolution and Ecology 106, 110, 114, residence at or near Bodega Marine Laboratory required. Student must complete the application available at http://www.bml.ucdavis.edu. An examination of critical environmental issues occurring in coastal waters. Course links together material from concurrent courses at BML to develop an integrative understanding of marine environments and their conservation. Includes laboratory, small group discussions, and interaction with visiting speakers. May be repeated twice for credit. (Same Course as Evolution and Ecology 111.) GE credit: SciEng | SE, SL.—IV. (IV.) Gaylord, Largier

116N. Oceanography (3)

Lecture—2 hours; laboratory—3 hours; field work. Prerequisite: one of Geology 1, 2, 16 or 50. Advanced oceanographic topics: Chemical, physical, and biological aspects of the ocean; oceanic research methods and data analysis; marine resources, anthropogenic impacts, and climate change; integrated earth/ocean/atmosphere systems; temporary issues in research. Segment devoted to human use. (Same course as Geology 150B.) GE credit: SciEng | SE, SL.—II. (II.) McClain

2. World Ecosystems & Geography (3)

30. World Ecosystems & Geography (3)

Lecture—3 hours; discussion—1 hour. Prerequisite: Physics 1A or 7A, Mathematics 16B or 21B, and Biological Sciences 1A. Application of physical and biological principles, ecological concepts, and systems approach to policy analysis of atmospheric, freshwater and marine environments, land use, energy supplies and technology, and other resources. GE credit: SciEng | QL, SE, SL.—II. (II.) Holyok

127. Plant Conservation Biology (4)

Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing or consent of instructor; concurrent enrollment in at least one course from courses 124, 152, Evolution and Ecology 106, 110, 114, residence at or near Bodega Marine Laboratory required. Student must complete the application available at http://www.bml.ucdavis.edu. An examination of critical environmental issues occurring in coastal waters. Course links together material from concurrent courses at BML to develop an integrative understanding of marine environments and their conservation. Includes laboratory, small group discussions, and interaction with visiting speakers. May be repeated twice for credit. (Same Course as Evolution and Ecology 111.) GE credit: SciEng | SE, SL.—IV. (IV.) Gaylord, Largier, Morgan, Sanford

4. Aquatic Ecosystems Analysis

150A. Physical and Chemical Oceanography (4)

Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing in a natural science and consent of instructor. Physical and chemical properties of seawater, fluid dynamics, air-sea interaction, currents, waves, tides, mixing, major oceanic geochemical cycles. (Same course as Geology 150A.) GE credit: SciEng | QL, SE, SL.—II. (II.) McClain

150B. Geological Oceanography (3)

Lecture—3 hours. Prerequisite: Geology 50 or 116. Introduction to the origins and evolution of ocean basins. Composition and structure of oceanic crust; marine volcanism; and deposition of marine sediments. Interpretation of geologic history of the oceanic floor in terms of plate tectonics and contemporary issues in research. Segment devoted to human use. (Same course as Geology 150B.) GE credit: SciEng | SE, SL.—IV. (IV.) Gaylord, Largier

151. Limnology (4)

Lecture—3 hours; discussion—1 hour. Special project. Prerequisite: Biological Sciences 1A and junior standing. The biology and productivity of inland waters with emphasis on the physical and chemical environment. GE credit: SciEng | SE, SL.—II. (II.) Largier

151L. Limnology Laboratory (3)

Laboratory—6 hours; two weekend field trips. Prerequisite: course 151 (may be taken concurrently); junior, senior, or graduate standing.Limnological studies of lakes, streams, and other aquatic systems with interpretation of aquatic ecology. GE credit: SciEng | SE, SL.
152. Coastal Oceanography (3) Lecture—2 hours; discussion—1 hour. Laboratory—3 hours. Fieldwork—3 hours. Prerequisite: upper division standing or approval of the instructor; physics (Physics 9B), calculus (Mathematics 21B) and exposure to physical and chemical oceanography. (Geological Science and Policy 150A) are recommended, residence at or near Bodega Marine Laboratory required. Student must complete the application available at http://www.bodega.ucsb.edu. The oceanography of coastal waters, including bays, rivers, upwelling systems and estuaries; focus on transport patterns, how they are affected by ecological and environmental parameters. Lecture, laboratory, fieldwork. GE credit: SciEng | SE, SL—IV. (IV) Larger

155. Wetland Ecology (4) Lecture—3 hours; discussion—1 hour. Prerequisite: course 100 or Plant Biology 117 required; course 110 or 151 recommended. Introduction to wetland ecology. The structure and function of major wetland types and principles that are common to wetlands that distinguish them from terrestrial and aquatic ecosystems. GE credit: SciEng | SE, SL—I. (I) Rejmanokova

155L. Wetland Ecology Laboratory (3) Lecture—6 hours; fieldwork—2 one-day weekend field trips. Prerequisite: course 155 required (may be taken concurrently). Modern and classic techniques in wetland field ecology. Emphasis on sampling procedures, vegetation analysis, laboratory procedures, and examples of successful wetland restoration techniques. GE credit: SciEng | SE, SL—I. (I) Rejmanokova

(e) Environmental Policy Analysis


161. Environmental Law (4) Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing and one course in environmental science (course 1, 10, 110, Biological Sciences 1A, Environmental Toxicology 10, or Resources 100); Political Science 1 and University Writing Program 1 recommended. Introduction for non-law School students to some of the principal issues in environmental and the judicial interpretation of some important environmental statutes, e.g., NEPA. GE credit: SocSci, Wrt | SS—III. (III) Arnold

162. Environmental Policy (4) Lecture—3 hours; discussion—1 hour. Prerequisite: Economics 1A. Compare economic wisdom with sociocultural approaches to understanding the causes of environmental problems and strategies for addressing them. Includes different approaches to the policy process, policy instruments, and environmental behavior. Applies these principles to several problems. GE credit: SocSci | SS—II. (II) Springborn


166. Energy Policy (4) Lecture—4 hours; term paper. Prerequisite: Economics 1A, Mathematics 168, or consent of instructor. Survey of primary energy resources (fossil, renewable, nuclear), energy conversion methods, future energy demand scenarios, and environmental impacts of energy. Overview of energy policy in the U.S. Analysis of policies to address energy-related environmental and national security issues. Offered in alternate years. GE credit: SocSci | SS—III. (III) Ogden

166A. Methods of Environmental Policy Evaluation (5) Lecture—3 hours; discussion—1 hour; term paper. Prerequisite: Statistics 13; Economics 100 or Agricultural and Resource Economics 100A, Mathemetics 168 or 218; Continuation of course 168A. Analysis of policies to address energy-related environmental and national security issues. Offered in alternate years. GE credit: SocSci | SS—III. (III) Ogden

166B. Methods of Environmental Policy Analysis (4) Lecture—3 hours; discussion—1 hour. Prerequisite: course 166A. Continuation of course 168A, with emphasis on examination of the literature for applications of research and evaluation techniques to problems of transportation, air and water pollution, land use, and energy policy. Students will apply the methods and concepts by means of a major project. GE credit: SocSci | SS—III. (III) Sancristi

169. Water Policy and Politics (3) Lecture—3 hours. Prerequisite: Economics 1A or Political Science 100A, Economic and Resource Economics 100A recommended. Analysis of policies designed to conserve water, including issues of water pollution/quality and water supply. The politics of water decision-making and the effectiveness of water policy. Broad focus on federal water policy, with case examples from significant national and state agencies. GE credit: SocSci | SS—III. (III) Lubel

170. Conservation Biology Policy (4) Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 and Economics 1A, Economics 100 or Agricultural and Resource Economics 100A recommended. Analysis of policies designed to conserve species and their habitats. Emphasis on how individual incentives affect the success of conservation policies. Valuation of biodiversity and the economic and economic and biodiversity. Criteria for deciding conservation priorities. GE credit: SciEng or SocSci | SE or SS—III. (III) Schwindt

171. Urban and Regional Planning (4) Lecture—3 hours; discussion—1 hour; term paper. Prerequisite: course 1, a course in social science and a course in environmental science. How cities plan for growth in ways that minimize environmental harm. Standard methods of general plan zoning ordinance) and innovative new approaches. Focus on planning requirements and practices in California. Relationships between local, regional, state, and federal policy. GE credit: SocSci | SS—VE—III. (III) Hardy

172. Public Lands Management (4) Lecture—3 hours; discussion—1 hour. Prerequisite: Economics 1A. Investigation of alternative approaches to public land management by federal and state agencies. The role each agency’s legislation plays in determining the range of resource allocation. GE credit: SocSci | AGCM, SS—I. (I) Lubel

173. Land Use and Growth Controls (4) Lecture—3 hours; discussion—1 hour. Prerequisite: Political Science 1, Economics 1A, intermediate statistics (Sociology 106 or Statistics 102 or the equivalent) and local government Behavioral Science 157, 158 or Political Science 100, 102 or 104. Exposes students to the economic, political, and legal factors affecting land use and growth controls, and helps students critically evaluate written materials in terms of their arguments and supporting data. GE credit: SocSci | SS.

175. Natural Resource Economics (4) Lecture—3 hours; discussion—1 hour. Prerequisite: Agricultural and Resource Economics 100B or Economics 100 or the equivalent. Economic concepts and policy issues associated with natural resources, renewable resources (ground water, forests, fisheries, and wildlife populations) and non-renewable resources (minerals and energy resources). (Same course as Agricultural and Resource Economics 175) GE credit: SciEng | Wrt

176. Applied Research Methods (4) Lecture—3 hours; discussion—1 hour. Prerequisite: Statistics 103 or Sociology 106 or the equivalent. Research methods for analysis of urban and regional land use, transportation, and environmental problems. Research design and data collection methods; demographic analysis; basic forecasting, air quality, and transportation models. Collection, interpretation, and critical evaluation of data. GE credit: SocSci | QL, SS—II. (II) Handy

179. Environmental Impact Assessment (4) Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing and one course in environmental science (course 100, 110 or the equivalent). Introduction to the information resources used in environmental impact assessments and application. GE credit: SocSci (P/NP grading only). GE credit: SocSci | SS—II. (II) Quinn

179L. Environmental Impact Reporting Using Geographic Information Systems (2) Laboratory/discussion—2 hours; laboratory—4 hours. Prerequisite: course 179 concurrently. Introduction to Geographic Information Systems (GIS) by using ArcView for assessment and environmental planning. Nature of data typically used in environmental impact analysis. Emphasis on how environmental information is applied to planning, environmental regulation, and public policymaking, with case studies from California land use and natural resource policy. GE credit: SocSci | SS—II. (II) Handy

(g) Other Courses

190. Workshops on Environmental Problems (1-8) Laboratory—2-16 hours. Prerequisite: consent of instructor. Workshops featuring empirical analyses of contemporary environmental problems by multidisciplinary student teams. Guided by faculty and lay professionals, the teams seek to develop an integrated view of a problem and outline a series of alternative solutions. Open to all upper division and graduate students. (P/NP grading only.) GE credit: SE—I, II, III. (I, II, III)

191A. Workshop on Food System Sustainability (3) Lecture—2 hours; laboratory—3 hours. Prerequisite: upper division standing. Planned in conjunction with Agricultural Systems and Environment 155, Community and Regional Development 20, Agricultural and Resource Economics 121, Plant Sciences 150 or consent of the instructor. Priority enrollment for seniors in the sustainable agriculture and food systems major; limited to 25 students per section. First in a two-quarter senior capstone course sequence. Identify projects addressing specific problems and

Quarter Offered: T=Fall, W=Winter, S=Spring, V=Summer; 2015-2016 offering in parentheses

Pre-Fall 2011 General Education (GE): AH=Arts and Humanities; SciEng=Science and Engineering; SocSci=Social Sciences; Div=Diverse; Dom=Diversity; Wrt=Writing Experience

Fall 2011 and on Revised General Education (GE): AH=Arts and Humanities; SE=Science and Engineering; SS=Social Sciences; ACGH=American Cultures; DD=Diverse Domain, OL=Oral Skills, QL=Quantitative, SL=Scientific, VL=Visual, WC=World Cultures, WE=Writing Experience
opportunities of sustainable agriculture and food systems, form multidisciplinary teams, and identify and conduct projects that stakeholders to understand their needs and concerns. GE credit: SciEng | SE.—I. (I.) Tomich

191B. Workshop on Food System Sustainability (5)
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 191A. Priority enrollment for seniors in the sustainable agriculture and food systems major, limited to 25 students per section. Completion of course 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 for action, 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 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 (Y (1-5)
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 164); 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 168a or the equivalent); Agricultural and Resource Economics 176. Methods and practices of policy analysis; philosophical and intellectual bases of policy analysis and the political role of policy analysis. (Same course as Ecology 212B.) Offered in alternate years. (III.) Sprabody

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.) Rejean-kovac

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 simulation modeling; 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 policies. (Same course as Civil and Environmental Engineering 252.)—III. Spera

275. Economic Analysis of Resource and Environmental Policies (4)
Lecture/discussion—4 hours. Prerequisite: Agricultural and Resource Economics 204/Economics 204. Development of demand, supply and market failure concepts, welfare economics, theory of renewable and non-renewable resource use, and political economic models. Applications to policy issues regarding the agricultural/environmental 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 issues in the philosophy of the social sciences. How to design research that acknowledges theoretical assumptions and that is likely to produce evidence in an inter-subjectively reliable fashion with explicit recognition of its uncertainties.

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 299; 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

(Zachary A. Wong, Ph.D., Adjunct Professor)

Faculty
Gary N. Chen, Ph.D., Professor
(Environmental Toxicology, Nutrition)
Michael S. Denison, Ph.D., Professor
Nilesh Gokhade, Ph.D., Assistant Professor
Michelle La Merrill, Ph.D., M.P.H., Assistant Professor
Patricia Oteiza, Ph.D., Professor
(Environmetal Toxicology, Nutrition)
Robert H. Rice, Ph.D., Professor
Takayuki Shibamoto, Ph.D., Distinguished Professor
Ronald S. Tjoerdema, Ph.D., Professor
Barry W. Wilson, Ph.D., Professor
(Animal Science, Environmental Toxicology)
Andrew Whitehead, Ph.D., Assistant Professor
Matthew J. Wood, Ph.D., Associate Professor
Qi Zhang, Ph.D., Associate Professor

Emeriti Faculty
Arthur Craigmill, Ph.D., Specialist in Cooperative Extension, Emeritus
Donald G. Crosby, Ph.D., Professor Emeritus
Dennis P. H. Hsieh, Sc.D., Professor Emeritus
James N. Seiber, Ph.D., Professor Emeritus
Michael W. Stimmann, Ph.D., Specialist in Cooperative Extension, Emeritus
Dorothy E. Woolley, Ph.D., Professor Emeritus

Affiliated Faculty
George V. Alexeeff, Ph.D., Adjunct Professor
Deborah Bennett, Ph.D., Associate Professor
(Public Health Sciences, School of Medicine)
Matt Hengel, Ph.D., Assistant Adjunct Professor
Dirk Holstede, Ph.D., Adjunct Professor
Noman Kado, Ph.D., Adjunct Professor
Sree Kanthaswamy, Ph.D., Associate Adjunct Professor
John Knezovich, Ph.D., Adjunct Professor
Charlie Li, Ph.D., Assistant Adjunct Professor
Melanie Marty, Ph.D., Adjunct Associate Professor
Alison E. Mitchell, Ph.D., Professor
(Food Science and Technology)
Cecilia Van Berloedinghen, Ph.D., Lecturer
(UC Davis Extension Forensics Program and Department of Justice)
Zachary A. Wong, Ph.D., Adjunct Professor

The Major Program

Toxic agents found in the environment include pesticides, food additives, industrial waste, and metals as well as chemicals produced by animals, plants, fungi and bacteria. Students in the Environmental Toxicology major learn how toxicants produce adverse effects by understanding both their environmental fates and biological activities. They learn about monitoring concentrations and the distribution and persistence of agents found in water, soil, air and foods. Toxicity testing procedures and exposure assessments are used to help evaluate potential for harm to humans and other species. By understanding the cellular targets and biochemical mechanisms of perturbation by toxicants, toxicologists can better estimate adverse effects. Overall, students learn mechanisms by which toxic agents act, their origin and fate and how toxicologists evaluate the risk of adverse effects and balance them against the benefits of use.

The Program. Preparatory courses in biology, chemistry, mathematics, and physics are required to provide fundamental principles which underlie toxicology. Students in the major are expected to understand the environmental fates and biological activities of different classes of toxic substances, and the legislative issues which arise from chemical use. Opportunities are available to develop in-depth understanding in areas of emphasis through selection of electives.

Specializations/Emphases. Elective course work in many disciplines can complement the required core courses. Providing a framework for selecting restricted electives, the major offers specializations in (1) Environmental Toxicology and Chemistry, (2) Forensic Science and Regulatory Toxicology, and (3) Molecular and Biomedical Toxicology. The first category includes topics in chemical fate, transport and degradation, as well as ecology, wildlife, and...