ENVIRONMENTAL TOXICOLOGY (ETX)

College of Agricultural & Environmental Sciences

ETX 010 — Introduction to Environmental Toxicology (3 units)

Course Description: Hazardous substances, their effects on humans and their actions and movement in the environment. Emphasis on substances of current concern.
Learning Activities: Lecture 3 hour(s).
Grade Mode: Letter.
General Education: Science & Engineering (SE); Scientific Literacy (SL).

ETX 020 — Introduction to Forensic Science (3 units)

Course Description: 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, guidance on training. Real cases discussed; demonstrations of methods provided.
Learning Activities: Lecture 3 hour(s).
Grade Mode: Letter.
General Education: Science & Engineering (SE); Scientific Literacy (SL); Visual Literacy (VL).

ETX 030 — Chemical & Drug Use & Abuse (3 units)

Course Description: Overview of chemical use and abuse in our society. Effects of chemicals (therapeutic drugs, pesticides, food additives, herbal remedies, environmental contaminants, and recreational drugs) on humans and other living systems.
Learning Activities: Lecture 3 hour(s).
Grade Mode: Letter.
General Education: Science & Engineering (SE).

ETX 040 — Contaminants in Our Environment (3 units)

Course Description: Contaminants in the environment (air, water, and soil) that influence the health of the environment, wildlife, and humans. An emphasis on contaminant properties, sources, and movement, public policy, and applying quantitative reasoning.
Learning Activities: Lecture/Discussion 3 hour(s).
Grade Mode: Letter.
General Education: Science & Engineering (SE); Scientific Literacy (SL).

ETX 092 — Internship (1-12 units)

Course Description: Work experience off and on campus in all subject areas offered in the College of Agricultural & Environmental Sciences. Internships supervised by a member of the faculty.
Prerequisite(s): Consent of instructor; lower division standing.
Learning Activities: Internship 3-36 hour(s).
Grade Mode: Pass/No Pass only.
General Education: Science & Engineering (SE).

ETX 098 — Directed Group Study (1-5 units)

Course Description: Group study on focused topics in Environmental Toxicology. Topic varies according to instructor.
Prerequisite(s): Consent of instructor.
Learning Activities: Variable.
Repeat Credit: May be repeated.
Grade Mode: P/NP only.

ETX 099 — Special Study for Undergraduates (1-5 units)

Course Description: Special study for undergraduates.
Prerequisite(s): Consent of instructor.
Learning Activities: Variable.
Grade Mode: Pass/No Pass only.
General Education: Science & Engineering (SE).

ETX 101 — Principles of Environmental Toxicology (4 units)

Course Description: 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.
Prerequisite(s): (CHE 008B or CHE 118B or CHE 128B); BIS 002A.
Learning Activities: Lecture 3 hour(s), Discussion 1 hour(s).
Grade Mode: Letter.
General Education: Science & Engineering (SE); Scientific Literacy (SL).

ETX 102A — Environmental Fate of Toxicants (4 units)

Course Description: Properties of toxic chemicals influencing their distribution and transformations; action of environmental forces affecting toxicant breakdown, movement, and accumulation; sources and occurrence of major classes of environmental toxicants.
Prerequisite(s): CHE 008B or CHE 118B or CHE 128B; or consent of instructor.
Learning Activities: Lecture 3 hour(s), Discussion 1 hour(s).
Credit Limitation(s): Not open for credit to students who have completed ETX 112A.
Grade Mode: Letter.
General Education: Science & Engineering (SE); Quantitative Literacy (QL); Scientific Literacy (SL); Visual Literacy (VL); Writing Experience (WE).

ETX 102B — Quantitative Analysis of Environmental Toxicants (5 units)

Course Description: Sample preparation methods for trace analysis of environmental toxicants. Concept and techniques of advanced analytical instrumentation. Interpretation and use of analytical data.
Prerequisite(s): ETX 102A.
Learning Activities: Lecture 3 hour(s), Laboratory 3 hour(s), Discussion 1 hour(s).
Credit Limitation(s): Not open for credit to students who have completed ETX 112B.
Grade Mode: Letter.
General Education: Science & Engineering (SE); Visual Literacy (VL).

ETX 103A — Biological Effects of Toxicants (4 units)

Course Description: Biological effects of toxic substances in living organisms. Metabolism, cellular and tissue targets, mechanisms of action, and pathological effects.
Prerequisite(s): BIS 102; NPB 101 ETX 101 recommended.
Learning Activities: Lecture 3 hour(s), Discussion 1 hour(s).
Credit Limitation(s): Not open for credit to students who have taken ETX 114A.
Grade Mode: Letter.
General Education: Science & Engineering (SE).

ETX 103B — Biological Effects of Toxicants: Experimental Approaches (5 units)

Course Description: Experimental approaches for assessing the biological effects of toxicants.
Prerequisite(s): ETX 103A.
Learning Activities: Lecture 3 hour(s), Laboratory 3 hour(s), Discussion 1 hour(s).
Credit Limitation(s): Not open for credit to students who have taken ETX 114B.
Grade Mode: Letter.
General Education: Science & Engineering (SE); Visual Literacy (VL); Writing Experience (WE).

ETX 104 — Environmental & Nutritional Factors in Cellular Regulation & Nutritional Toxicants (4 units)

Course Description: Cellular regulation from nutritional/toxicological perspective. Emphasis: role of biofactors on modulation of signal transduction pathways, role of specific organelles in organization/regulation of metabolic transformations, major cofactor functions, principles of pharmacology/toxicology important to understanding nutrient/toxicant metabolism.
Prerequisite(s): BIS 101; (BIS 103 or ABI 103).
Learning Activities: Lecture 3 hour(s), Discussion 1 hour(s).
Cross Listing: NUT 104.
Grade Mode: Letter.
General Education: Science & Engineering (SE); Oral Skills (OL); Scientific Literacy (SL).

ETX 110 — Toxic Tragedies & Their Impact on Society (2 units)

Course Description: Examination of toxic tragedies, their origins, consequences, and effects on toxic regulation.
Prerequisite(s): Upper division status or consent of instructor required.
Learning Activities: Lecture 2 hour(s).
Grade Mode: Letter.
General Education: Science & Engineering (SE); Oral Skills (OL); Scientific Literacy (SL); Writing Experience (WE).

ETX 111 — Introduction to Mass Spectrometry (3 units)

Course Description: 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.
Prerequisite(s): CHE 118C or CHE 128C.
Learning Activities: Lecture 3 hour(s).
Grade Mode: Letter.
General Education: Science & Engineering (SE).

ETX 120 — Perspectives in Aquatic Toxicology (4 units)

Course Description: Toxic substances, their fate in marine and freshwater systems, and their effects on aquatic organisms, populations, and ecosystems. Emphasis will be on substances and issues of current concern.
Prerequisite(s): CHE 008B; (CHE 118B or CHE 128B); BIS 002A; or consent of instructor.
Learning Activities: Lecture 3 hour(s), Discussion 1 hour(s).
Grade Mode: Letter.
General Education: Science & Engineering (SE); Oral Skills (OL); Scientific Literacy (SL); Visual Literacy (VL); Writing Experience (WE).

ETX 127 — Environmental Stress & Development in Marine Organisms (10 units)

Course Description: 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 advanced experimental methods.
Prerequisite(s): ETX 101 or BIS 102 or BIS 104; and consent of instructor, or the equivalent; ETX 114A or NUT 114 recommended.
Learning Activities: Lecture 4 hour(s), Laboratory 12 hour(s), Discussion 2 hour(s).
Cross Listing: NUT 127.
Grade Mode: Letter.
General Education: Science & Engineering (SE); Oral Skills (OL); Quantitative Literacy (QL); Scientific Literacy (SL); Visual Literacy (VL); Writing Experience (WE).

ETX 128 — Food Toxicology (3 units)

Course Description: Chemistry and biochemistry of toxins occurring in foods, including plant and animal toxins, intentional and unintentional food additives. The assessment of food safety and toxic hazards.
Prerequisite(s): BIS 102; BIS 103.
Learning Activities: Lecture 3 hour(s).
Cross Listing: FST 128.
Grade Mode: Letter.
General Education: Science & Engineering (SE).

ETX 130 — Role & Applications of Toxicology in Modern Industry (3 units)

Course Description: 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.
Prerequisite(s): ETX 101; ETX 103A recommended.
Learning Activities: Lecture 3 hour(s).
Grade Mode: Letter.
General Education: Science & Engineering (SE); Oral Skills (OL); Scientific Literacy (SL); Visual Literacy (VL); Writing Experience (WE).

ETX 131 — Environmental Toxicology of Air Pollutants (3 units)

Course Description: Field trip required. Toxicology of air pollutants in the ambient, indoor, and occupational environments. Health effects, sources, environmental fates, pulmonary responses, sampling and analyses, and air-quality criteria and standards. Field trip required.
Prerequisite(s): CHE 008B (can be concurrent); or the equivalent; BIS 102 recommended.
Learning Activities: Lecture 3 hour(s).
Grade Mode: Letter.
General Education: Science & Engineering (SE); Visual Literacy (VL).

ETX 135 — Health Risk Assessment of Toxicants (3 units)

Course Description: Current practices of health risk assessment of environmental chemicals using toxicological principles and their application to regulatory control of these chemicals.
Prerequisite(s): ETX 101; ETX 114A recommended.
Learning Activities: Lecture 3 hour(s).
Grade Mode: Letter.
General Education: Science & Engineering (SE); Quantitative Literacy (QL); Scientific Literacy (SL); Visual Literacy (VL).

ETX 138 — Legal Aspects of Environmental Toxicology (3 units)

Course Description: 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 regulatory agencies; alternatives to government control.
Prerequisite(s): Consent of instructor. ETX 010 or ETX 101 recommended.
Learning Activities: Lecture 3 hour(s).
Grade Mode: Letter.
General Education: Science & Engineering (SE); Visual Literacy (VL); Writing Experience (WE).

ETX 140 — Genes & the Environment (3 units)

Course Description: Evaluation of evidence that human health and disease susceptibility result from complex interactions between genes and the environment. Critical thinking through problem solving using the scientific method with examples of cancer, metabolic, cardiovascular, and neurological health outcomes related to environmental and genetic risk factors and mechanisms.
Prerequisite(s): BIS 002A (can be concurrent) or MCB 010 (can be concurrent) or BIS 101 (can be concurrent); college-level coursework in environmental toxicology recommended.
Learning Activities: Lecture/Discussion 3 hour(s).
Grade Mode: Letter.
General Education: Science & Engineering (SE); Quantitative Literacy (QL); Scientific Literacy (SL).

ETX 146 — Exposure & Dose Assessment (3 units)

Course Description: Exposure component of risk assessment; specifically, the presence and/or formation of toxic substances in environmental media, their movement within and between contaminated media, and the contacts of human populations with those media.
Prerequisite(s): ETX 112A; ETX 135 recommended.
Learning Activities: Lecture 3 hour(s).
Grade Mode: Letter.
General Education: Science & Engineering (SE); Quantitative Literacy (QL); Scientific Literacy (SL); Visual Literacy (VL).

ETX 150 — Evolution in Human-Altered Environments (4 units)

Course Description: Effects of recent human alterations to the natural environment on the evolutionary trajectories of diverse species, including our own.
Prerequisite(s): BIS 002B.
Learning Activities: Lecture/Discussion 3 hour(s), Term Paper.
Enrollment Restriction(s): Open to upper division students.
Grade Mode: Letter.
General Education: Science & Engineering (SE); Scientific Literacy (SL); Writing Experience (WE).

ETX 180 — Chemistry & Toxicology of Metals (4 units)

Course Description: Metal contaminants in the environment (air, water, and soil) and their effects on the health of the environment and humans. How the chemistry of metals ultimately controls their environmental fate and toxicity, application of numerical models, and discussion of case studies.
Prerequisite(s): ETX 102A or CHE 008B or CHE 118B or CHE 128B; or consent of instructor.
Learning Activities: Lecture/Discussion 4 hour(s).
Grade Mode: Letter.
General Education: Science & Engineering (SE); Quantitative Literacy (QL); Scientific Literacy (SL); Visual Literacy (VL).

ETX 190 — Seminar (1 unit)

Course Description: Selected topics presented by students, faculty, or outside speakers covering current research and instructional activities within environmental toxicology. Reports and discussion concerning oral and written presentations, literature sources, and career opportunities.
Prerequisite(s): Consent of instructor.
Learning Activities: Seminar 1 hour(s).
Repeat Credit: May be repeated.
Grade Mode: Pass/No Pass only.
General Education: Science & Engineering (SE).

ETX 190C — Research Group Conference (1 unit)

Course Description: Weekly conference of advanced research methods and the interpretation of research results.
Prerequisite(s): Consent of instructor.
Learning Activities: Discussion 1 hour(s).
Grade Mode: Pass/No Pass only.
General Education: Science & Engineering (SE).

ETX 190S — Environmental Toxicology Career Seminar (1 unit)

Course Description: Careers in environmental toxicology; discussions with graduates from the Department of Environmental Toxicology and other experts in the field.
Learning Activities: Seminar 1 hour(s).
Grade Mode: Pass/No Pass only.
General Education: Science & Engineering (SE).

ETX 192 — Internship (1-12 units)

Course Description: 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.
Prerequisite(s): Consent of instructor; completion of 84 units.
Learning Activities: Internship 3-36 hour(s).
Grade Mode: Pass/No Pass only.
General Education: Science & Engineering (SE).

ETX 194HA — Honors Research (3 units)

Course Description: 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.
Prerequisite(s): Consent of instructor; senior standing; minimum GPA of 3.250.
Learning Activities: Discussion 1 hour(s), Laboratory 6 hour(s).
Grade Mode: Letter.
General Education: Science & Engineering (SE).

ETX 194HB — Honors Research (3 units)

Course Description: 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.
Prerequisite(s): Consent of instructor; senior standing; minimum GPA of 3.250.
Learning Activities: Discussion 1 hour(s), Laboratory 6 hour(s).
Grade Mode: Pass/No Pass only.
General Education: Science & Engineering (SE).

ETX 194HC — Honors Research (3 units)

Course Description: Continuation of ETX 194HA & ETA 194HB.
Prerequisite(s): Consent of instructor; senior standing, minimum GPA of 3.250.
Learning Activities: Laboratory 9 hour(s), Discussion 1 hour(s).
Grade Mode: Pass/No Pass only.
General Education: Science & Engineering (SE).

ETX 197T — Tutoring in Environmental Toxicology (1-5 units)

Course Description: Teaching toxicology including conducting discussion groups for regular departmental courses under direct guidance of staff.
Prerequisite(s): Consent of instructor; advanced standing in Environmental Toxicology, a related major, or the equivalent experience.
Learning Activities: Variable.
Repeat Credit: May be repeated 5 unit(s).
Grade Mode: Pass/No Pass only.
General Education: Science & Engineering (SE).

ETX 198 — Directed Group Study (1-5 units)

Course Description: Directed group study.
Prerequisite(s): Consent of instructor.
Learning Activities: Variable.
Grade Mode: Pass/No Pass only.
General Education: Science & Engineering (SE).

ETX 199 — Special Study for Advanced Undergraduates (1-5 units)

Course Description: Special study for advanced undergraduates.
Learning Activities: Variable.
Grade Mode: Pass/No Pass only.
General Education: Science & Engineering (SE).

ETX 203 — Environmental Toxicants (4 units)

Course Description: Toxic chemicals: selected topics illustrating their occurrence, structure, and the reactions underlying detection, toxicity, fate, and ecological importance.
Prerequisite(s): CHE 008B or CHE 128C; and consent of instructor, or the equivalent of CHE 128C.
Learning Activities: Lecture 3 hour(s), Discussion 1 hour(s).
Grade Mode: Letter.

ETX 214 — Mechanisms of Toxic Action (3 units)

Course Description: Chemical, biochemical, and molecular mechanisms underlying the adverse effects of toxic chemicals. Students are required to write a grant proposal and participate in a grant review panel.
Prerequisite(s): BIS 102; BIS 103; and consent of instructor.
Learning Activities: Lecture 3 hour(s).
Grade Mode: Letter.

ETX 220 — Analysis of Toxicants (3 units)

Course Description: Principles of microanalysis of toxicants. Theoretical considerations regarding separation, detection and quantitative determination of toxicants using chemical and instrumental techniques.
Prerequisite(s): Coursework in organic chemistry.
Learning Activities: Lecture 3 hour(s).
Cross Listing: FOR 220.
Grade Mode: Letter.

ETX 220L — Analysis of Toxicants Laboratory (2 units)

Course Description: Laboratory techniques for microanalysis of toxicants. Separation, detection, and quantitative determination of toxicants using chemical and instrumental methods.
Prerequisite(s): ETX 220 (can be concurrent); consent of instructor.
Learning Activities: Laboratory 6 hour(s).
Grade Mode: Letter.

ETX 234 — Current Topics in Neurotoxicology (3 units)

Course Description: General principles of neurotoxicology, the cell and molecular mechanisms and health impacts of specific neurotoxicants and the contribution of neurotoxic compounds to complex eurodevelopmental disorders and neurodegenerative diseases.
Prerequisite(s): Core courses in one of the following graduate programs: Pharmacology Toxicology (PTX), Agricultural Environmental Chemistry (AGC), Biochemistry Molecular Biology (BMB), Cell Developmental Biology (CDB), Immunology (IMM), Molecular Cellular Integrative Physiology (MCP) or Neuroscience (NSC).
Learning Activities: Lecture 3 hour(s).
Enrollment Restriction(s): Restricted to upper level undergraduate students must obtain permission from the course coordinator.
Cross Listing: MCP 234, VMB 234.
Grade Mode: Letter.

ETX 240 — Ecotoxicology (3 units)

Course Description: Principles of toxicology as applied to chemical action on natural populations, communities, and ecosystems. Physical, chemical, and biological characteristics which influence ecotoxic effects, modeling, and field research. Selected case histories are analyzed and presented in class.
Prerequisite(s): Consent of instructor; elementary course in toxicology and ecology or the equivalent.
Learning Activities: Lecture 3 hour(s).
Grade Mode: Letter.

ETX 250 — Reproductive Toxicology (3 units)

Course Description: Application of toxicological principles in reproductive studies. Effects of toxicants on the male, female, and developing embryo/fetus. Critical evaluation of reproductive toxicity studies and development of mechanistic approaches to understanding how chemical exposure can adversely affect reproduction.
Prerequisite(s): PTX 203.
Learning Activities: Lecture 1.50 hour(s), Lecture/Discussion 1.50 hour(s).
Grade Mode: Letter.

ETX 260 — Immunotoxicology (3 units)

Course Description: Provides students with skills and knowledge for evaluating and applying research on the impact of environmental toxicants on immunological function in human and wildlife populations.
Prerequisite(s): Undergraduate or graduate introduction to immunology coursework recommended but not required; graduate standing or consent of instructor.
Learning Activities: Lecture 3 hour(s).
Grade Mode: Letter.

ETX 270 — Toxicology of Pesticides (3 units)

Course Description: Classification and chemical properties of pesticides, their mode of action, metabolism and disposition, pesticide resistance, effects on human health and ecological health and methods of risk benefit analyses.
Prerequisite(s): ETX 101; one course each in (a) Organic Chemistry, (b) Biochemistry, (c) Toxicology (ETX 101 or equivalent), or with consent of instructor; graduate standing.
Learning Activities: Lecture 3 hour(s).
Grade Mode: Letter.

ETX 278 — Molecular Techniques (3 units)

Course Description: Recombinant DNA technology and its applications.
Prerequisite(s): Graduate standing or consent of instructor.
Learning Activities: Lecture 3 hour(s).
Cross Listing: FOR 278.
Grade Mode: Letter.

ETX 280 — Forensic DNA Analysis (3 units)

Course Description: Foundation in theory and practice of forensic DNA analysis; past, present, and emerging technologies; legal and quality assurance issues. DNA extraction, DNA quantitation, multiplex amplification of STR loci, capillary electrophoresis of amplified products, and analysis of STR typing data.
Prerequisite(s): Coursework in genetics and molecular biology.
Learning Activities: Lecture 3 hour(s).
Enrollment Restriction(s): Graduate standing; consent of instructor required for all students not enrolled in the MS Forensics program.
Cross Listing: FOR 280.
Grade Mode: Letter.

ETX 281 — Principles & Practice of Forensic Serology & DNA Analysis (3 units)

Course Description: Comprehensive overview of forensic serology and DNA typing techniques and technologies. Strong emphasis on real-world applications, including preservation and tracking of biological evidence, detection and identification of bodily fluids, and methods to extract, quantify, and type human DNA.
Prerequisite(s): (FOR 278 or ETX 278) or (FOR 280 or ETX 280); or equivalent; consent of instructor.
Learning Activities: Lecture 2 hour(s), Discussion/Laboratory 3 hour(s).
Enrollment Restriction(s): Restricted to students enrolled in the M.S. in Forensic Science Program or by consent of Forensic Science Program Director.
Cross Listing: FOR 281.
Grade Mode: Letter.

ETX 284 — Non-Human Forensic DNA; Theory & Casework Application (2 units)

Course Description: Provides a comprehensive understanding of plant and animal forensic biology in terms of sample collection, preservation, analytical methods, and of the invaluable lines of inquiry these forensic evidence may permit.
Prerequisite(s): Consent of instructor required for all students not enrolled in the MS Forensics program; upper division Molecular Biology and Genetics or its equivalent.
Learning Activities: Lecture 2 hour(s).
Enrollment Restriction(s): Restricted to graduate standing.
Cross Listing: FOR 284.
Grade Mode: Letter.

ETX 290 — Seminar (1 unit)

Course Description: Current topics in environmental toxicology.
Learning Activities: Seminar 1 hour(s).
Grade Mode: Satisfactory/Unsatisfactory only.

ETX 290C — Advanced Research Conference (1 unit)

Course Description: Presentation and critical discussion of advanced research methods and interpretation of research results. Designed primarily for graduate students.
Prerequisite(s): Consent of instructor.
Learning Activities: Lecture/Discussion 1 hour(s).
Grade Mode: Satisfactory/Unsatisfactory only.

ETX 297T — Tutoring in Environmental Toxicology (1-5 units)

Course Description: Teaching toxicology including conducting discussion groups for regular departmental courses under direct guidance of staff.
Prerequisite(s): Consent of instructor; graduate standing in Environmental Toxicology, a related major, or the equivalent experience.
Learning Activities: Variable.
Repeat Credit: May be repeated 5 unit(s).
Grade Mode: Satisfactory/Unsatisfactory only.

ETX 298 — Group Study (1-5 units)

Course Description: Group study.
Prerequisite(s): Consent of instructor.
Learning Activities: Variable.
Grade Mode: Letter.

ETX 299 — Research (1-12 units)

Course Description: Research.
Prerequisite(s): Consent of instructor.
Learning Activities: Variable.
Grade Mode: Satisfactory/Unsatisfactory only.

ETX 396 — Teaching Assistant Training Practicum (1-4 units)

Course Description: Teaching assistant training.
Learning Activities: Variable.
Repeat Credit: May be repeated.
Grade Mode: Pass/No Pass only.