ENVIRONMENTAL TOXICOLOGY, BACHELOR OF SCIENCE

College of Agricultural & Environmental Sciences

The Major Program

Toxic agents 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 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 the 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.

The Program

Preparatory courses in biology, chemistry, mathematics, and physics are required to provide fundamental principles that 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 that arise from chemical use. Opportunities are available to develop an in-depth understanding in areas of emphasis through a selection of electives.

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) Ecotoxicology & Environmental Chemistry, (2) Forensic Science & Regulatory Toxicology, and (3) Molecular & Biomedical Toxicology. The first category includes topics in chemical fate, transport and degradation, as well as ecology, wildlife, and aquatic toxicology. The second category includes forensic science, environmental policy and management, and public health. The third category includes pharmacology, biotechnology, medicine, veterinary medicine, and food toxicology. Students are encouraged to select course work from these Emphases and beyond to match their interests.

Internships & Career Alternatives

Occupations that use environmental toxicology include risk assessment, pharmaceutical development, food additive toxicity testing, managing regulatory compliance, residue or forensic analysis, pest control, monitoring and field sampling, industrial hygiene, and environmental health and safety. A substantial proportion of graduates elect to pursue advanced professional training in law, medical, pharmacy, or veterinary medical school, or in graduate programs 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.

Lead Faculty Advisor

Andrew Whitehead

Environmental Toxicology Major Advisor

Erica Cefalo

Advising Center for the major is located at 1086 Academic Surge. Contact the Environmental Toxicology major advisor at 530-754-9796.

Code	Title	Units
Preparatory Subject Matter		
Biological Science		
BIS 002A	Introduction to Biology: Essentials of Life on Earth	5
BIS 002B	Introduction to Biology: Principles of Ecology & Evolution	5
BIS 002C	Introduction to Biology: Biodiversity & the Tree of Life	5
Chemistry		
Choose a series:		15
CHE 002A & CHE 002B & CHE 002C	General Chemistry and General Chemistry and General Chemistry	
CHE 002AH & CHE 002BH & CHE 002CH	Honors General Chemistry and Honors General Chemistry and Honors General Chemistry	
CHE 003A & CHE 003B & CHE 003C	Chemistry for Life Sciences: Determining Structure & Predicting Properties and Chemistry for Life Sciences: Predicting & Characterizing Chemical Change and Chemistry for Life Sciences: Controlling Processes & Synthetic Pathways	
Choose CHE 118 series or 128 series & 129A or 103 series:		10-12
CHE 118A & CHE 118B & CHE 118C	Organic Chemistry for Health & Life Sciences and Organic Chemistry for Health & Life Sciences and Organic Chemistry for Health & Life Sciences	
or		
CHE 128A & CHE 128B & CHE 128C & CHE 129A	Organic Chemistry and Organic Chemistry and Organic Chemistry and Organic Chemistry Laboratory	
or		
CHE 103A & CHE 103B	Chemistry for Life Sciences: Determining Organic Structures & Properties and Chemistry for Life Sciences: Predicting & Controlling Organic Pathways	
Mathematics		
Choose a series:		12
MAT 017A & MAT 017B & MAT 017C	Calculus for Biology & Medicine and Calculus for Biology & Medicine and Calculus for Biology & Medicine	
MAT 021A & MAT 021B & MAT 021C	Calculus and Calculus and Calculus	

Physics		
PHY 007A	General Physics	4
PHY 007B	General Physics	4
PHY 007C	General Physics	4
Statistics		
Choose one:		4
STA 100	Applied Statistics for Biological Sciences	
STA 103	Applied Statistics for Business & Economics	
STA 104	Applied Statistical Methods: Nonparametric Statistics	
STA 106	Applied Statistical Methods: Analysis of Variance	
STA 108	Applied Statistical Methods: Regression Analysis	
Upper Division Writing		
Choose one: [1]		4
UWP 101	Advanced Composition	
or UWP 101V	Advanced Composition	
or UWP 101Y	Advanced Composition	
UWP 104A	Writing in the Professions: Business Writing	
or UWP 104AY	Writing in the Professions: Business Writing	
UWP 104B	Writing in the Professions: Law	
UWP 104C	Writing in the Professions: Journalism	
UWP 104D	Writing in the Professions: Elementary & Secondary Education	
UWP 104E	Writing in the Professions: Science	
UWP 104F	Writing in the Professions: Health	
or UWP 104FY	Writing in the Professions: Health	
UWP 104I	Writing in the Professions: Internships	
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.		
Preparatory Subject Matter Subtotal		72-74
Depth Subject Matter		
Biological Science		
BIS 102	Structure & Function of Biomolecules	3
BIS 101	Genes & Gene Expression	3-4
or BIS 103	Bioenergetics & Metabolism	
Environmental Toxicology		
ETX 101	Principles of Environmental Toxicology	4
ETX 102A	Environmental Fate of Toxicants	4
ETX 102B	Quantitative Analysis of Environmental Toxicants	5
ETX 103A	Biological Effects of Toxicants	4
ETX 103B	Biological Effects of Toxicants: Experimental Approaches	5
Choose ETX 127 or two others:		6-10
ETX/NUT 127	Environmental Stress & Development in Marine Organisms	
or		
ETX/NUT 104	Environmental & Nutritional Factors in Cellular Regulation & Nutritional Toxicants	
ETX 120	Perspectives in Aquatic Toxicology	
ETX/FST 128	Food Toxicology	
ETX 130	Role & Applications of Toxicology in Modern Industry	
ETX 131	Environmental Toxicology of Air Pollutants	
ETX 135	Health Risk Assessment of Toxicants	
ETX 138	Legal Aspects of Environmental Toxicology	
ETX 146	Exposure & Dose Assessment	
Restricted Electives		
Choose three-four courses:		12-16
Electives selected for area of Emphasis with faculty advisor's approval with 6 unit combined maximum of 190, 192, 198, and 199; see department website for details.		
Depth Subject Matter Subtotal		46-55
Total Units		**118-129**

[1] Preferably, the course should be taken prior to enrollment in ETX 102B & ETX 103B.