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 in 1086 Academic Surge. Contact the Environmental Toxicology major advisor at 530-754-9796.

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<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
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<tr>
<td>BIS 002A</td>
<td>Introduction to Biology: Essentials of Life on Earth</td>
<td>5</td>
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<td>BIS 002B</td>
<td>Introduction to Biology: Principles of Ecology &amp; Evolution</td>
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<td>BIS 002C</td>
<td>Introduction to Biology: Biodiversity &amp; the Tree of Life</td>
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<td>CHE 003A</td>
<td>Chemistry for Life Sciences: Determining Structure &amp; Predicting Properties</td>
<td>15</td>
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<tr>
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Environmental Toxicology, Bachelor of Science 1
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:

STA 100
Applied Statistics for Biological Sciences 4
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

UWP 101 Advanced Composition
or UWP 101V Advanced Composition
or UWP 101Y Advanced Composition
UWP 104A Writing in the Professions: Business Writing
or UWP 104AV 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
or UWP 104AV 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:

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:

ETX/NUT 127 Environmental Stress & Development in Marine Organisms
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

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.