

# TOXICOLOGY (TOX)

## TOX 003, UNDERGRADUATE RESEARCH, 0 Credits

Students engage in research activities appropriate to their discipline; and through the research experience, to acquire skills, techniques, and knowledge relevant to their field of study. In consultation with a faculty mentor, students will engage in research activity, and make and execute a plan for a project.

## TOX 360, \*THE WORLD OF POISONS, 3 Credits

Provides a basic understanding of how we are exposed and respond to chemicals, examples of human diseases associated with toxic insult, the role of technology and the interface of society and toxicology in risk perception and legislation. (Bacc Core Course)

**Attributes:** CSST – Core, Synthesis, Science/Technology/Society

**Recommended:** One 3-credit course in chemistry or one 3-credit course in biology.

## TOX 401, RESEARCH, 1-16 Credits

**Equivalent to:** AC 401

*This course is repeatable for 16 credits.*

## TOX 405, READING AND CONFERENCE, 1-16 Credits

**Equivalent to:** AC 405

*This course is repeatable for 16 credits.*

## TOX 411, FUNDAMENTALS OF TOXICOLOGY, 3 Credits

Introduction to the discipline of toxicology. Examination of the basic concepts that define how chemicals are absorbed, distributed, metabolized, and eliminated by the body. Overview of associated dose/response relations.

**Prerequisite:** BB 350 (may be taken concurrently) with D- or better or BB 450 (may be taken concurrently) with D- or better or BB 490 (may be taken concurrently) with D- or better

## TOX 413, ENVIRONMENTAL TOXICOLOGY AND RISK ASSESSMENT, 3 Credits

Procedures for defining exposure and the use of toxicological data in defining risk assessment. Recent application of mechanistic concepts are reviewed.

**Prerequisite:** TOX 411 with D- or better

## TOX 429, TOXIC SUBSTANCES IN FOOD, 3 Credits

Toxicology and epidemiology of human exposures to pesticides and food toxicants.

**Prerequisite:** BB 350 (may be taken concurrently) with D- or better or BB 450 (may be taken concurrently) with D- or better or BB 490 (may be taken concurrently) with D- or better

**Equivalent to:** TOX 429H

## TOX 430, CHEMICAL BEHAVIOR IN THE ENVIRONMENT, 3 Credits

Applications of chemical concepts in the definition and solution of pollution problems; analytical considerations, thermodynamic factors influencing movement of chemicals, physical and metabolic transformations occurring in the environment.

**Prerequisite:** CH 123 with D- or better or CH 331 with D- or better

## TOX 435, \*GENES AND CHEMICALS IN AGRICULTURE: VALUE AND RISK, 3 Credits

A multidisciplinary course that examines the scientific, social, political, economic, environmental, and ethical controversies surrounding agricultural and natural resource biotechnologies. Lec/rec. CROSSLISTED as FES 435/TOX 435 and FES 535/MCB 535/TOX 535. (Bacc Core Course)

**Attributes:** CSST – Core, Synthesis, Science/Technology/Society

**Equivalent to:** FES 435, FES 435H, TOX 435H

**Recommended:** One quarter each of biology and chemistry  
*Available via Ecampus*

## TOX 435H, \*GENES AND CHEMICALS IN AGRICULTURE: VALUE AND RISK, 3 Credits

A multidisciplinary course that examines the scientific, social, political, economic, environmental, and ethical controversies surrounding agricultural and natural resource biotechnologies. Lec/rec. CROSSLISTED as FES 435/TOX 435 and FES 535/MCB 535/TOX 535. (Bacc Core Course)

**Attributes:** CSST – Core, Synthesis, Science/Technology/Society; HNRS – Honors Course Designator

**Equivalent to:** BI 435, BI 435H, FES 435, FS 435, FS 435H, TOX 435

**Recommended:** One quarter each of biology and chemistry

## TOX 455, ECOTOXICOLOGY: AQUATIC ECOSYSTEMS, 3 Credits

Focuses on transport, fate, and effects of toxic substances in freshwater ecosystems. There is special emphasis on impacts on fish.

**Prerequisite:** CH 331 with D- or better

## TOX 480, COMPUTATIONAL TOXICOLOGY AND RISK ASSESSMENT, 3 Credits

Provides an in-depth understanding of the current systems biology paradigm for chemical risk and drug safety assessment. Learn about novel technologies in computational chemistry, molecular biology and systems biology used to develop methods for risk assessment, including approaches for chemical prioritization for screening and testing, predictive models for high-throughput hazard identification and utilization of “big data” to determine chemical mechanisms of action and toxicity pathways. Apply these approaches to specific case studies in risk analysis, environmental health and toxicology.

**Recommended:** One year college chemistry and biology plus introductory toxicology or biochemistry

## **TOX 490, ENVIRONMENTAL FORENSIC CHEMISTRY, 3 Credits**

Principles of Good Laboratory Practice Standards, methodology, utility and limitations of chemical forensic methods as applied to real investigations.

**Recommended:** One year of college chemistry and one term of organic chemistry.

## **TOX 499, SPECIAL TOPICS, 1-16 Credits**

*This course is repeatable for 16 credits.*

## **TOX 501, RESEARCH, 1-16 Credits**

*This course is repeatable for 16 credits.*

## **TOX 503, THESIS, 1-16 Credits**

*This course is repeatable for 999 credits.*

## **TOX 505, READING AND CONFERENCE, 1-16 Credits**

*This course is repeatable for 16 credits.*

## **TOX 507, SEMINAR, 1-16 Credits**

*This course is repeatable for 16 credits.*

## **TOX 511, FUNDAMENTALS OF TOXICOLOGY, 3 Credits**

Introduction to the discipline of toxicology. Examination of the basic concepts that define how chemicals are absorbed, distributed, metabolized, and eliminated by the body. Overview of associated dose/response relations.

**Prerequisite:** BB 550 (may be taken concurrently) with C or better or BB 590 (may be taken concurrently) with C or better

## **TOX 512, TARGET ORGAN TOXICOLOGY, 3 Credits**

Examination of toxicological effects of chemicals at organ level. Normal physiology of the organ system is reviewed.

**Prerequisite:** TOX 511 with C or better

## **TOX 513, ENVIRONMENTAL TOXICOLOGY AND RISK ASSESSMENT, 3 Credits**

Procedures for defining exposure and the use of toxicological data in defining risk assessment. Recent application of mechanistic concepts are reviewed.

**Prerequisite:** TOX 511 with C or better

## **TOX 529, TOXIC SUBSTANCES IN FOOD, 3 Credits**

Toxicology and epidemiology of human exposures to pesticides and food toxicants.

**Recommended:** Completion or concurrent enrollment in BB 350, BB 450 or BB 490

## **TOX 530, CHEMICAL BEHAVIOR IN THE ENVIRONMENT, 3 Credits**

Applications of chemical concepts in the definition and solution of pollution problems; analytical considerations, thermodynamic factors influencing movement of chemicals, physical and metabolic transformations occurring in the environment.

**Recommended:** CH 106 and CH 331 and graduate standing.

## **TOX 535, GENES AND CHEMICALS IN AGRICULTURE: VALUE AND RISK, 3 Credits**

A multidisciplinary course that examines the scientific, social, political, economic, environmental, and ethical controversies surrounding agricultural and natural resource biotechnologies. Lec/rec. CROSSLISTED as FES 435/TOX 435 and FES 535/MCB 535/TOX 535.

**Equivalent to:** BI 535, FES 535, FS 535, MCB 535

**Recommended:** One quarter each of biology and chemistry  
*Available via Ecampus*

## **TOX 555, ECOTOXICOLOGY: AQUATIC ECOSYSTEMS, 3 Credits**

Focuses on transport, fate, and effects of toxic substances in freshwater ecosystems. There is special emphasis on impacts on fish.

**Recommended:** CH 331

## **TOX 557, SCIENTIFIC SKILLS AND ETHICS, 3 Credits**

Acquire a multitude of skills to launch and maintain productive extramurally funded careers as research scientists. Explore the ethical practices, data sharing approaches, and compliance requirements needed to conduct research. Examine the ethical use of human subjects and animals in research. Explore the changing landscape of intellectual property and commercialization policies for scientists. Introduces communication strategies for effective interactions with scientific peers, the general public and research sponsors.

**Equivalent to:** MCB 557

## **TOX 575, ADVANCED XENOBIOTIC METABOLISM AND DISPOSITION, 2 Credits**

Course will focus on structure, function and regulation of specific proteins that function in uptake, distribution, metabolism, and excretion of drugs and other chemicals that are foreign to the body (xenobiotics). The course will focus on proteins which are termed Phase I and Phase II xenobiotic metabolizing enzymes and xenobiotic transporters. There will be an emphasis on Cytochrome P450 enzymes and hepatic and renal xenobiotic transporter proteins and their key roles in xenobiotic metabolism and excretion.

**Recommended:** TOX 512

## **TOX 580, COMPUTATIONAL TOXICOLOGY AND RISK ASSESSMENT, 3 Credits**

Provides an in-depth understanding of the current systems biology paradigm for chemical risk and drug safety assessment. Learn about novel technologies in computational chemistry, molecular biology and systems biology used to develop methods for risk assessment, including approaches for chemical prioritization for screening and testing, predictive models for high-throughput hazard identification and utilization of "big data" to determine chemical mechanisms of action and toxicity pathways. Apply these approaches to specific case studies in risk analysis, environmental health and toxicology.

**Recommended:** One year college chemistry and biology plus introductory toxicology or biochemistry

## **TOX 590, ENVIRONMENTAL FORENSIC CHEMISTRY, 3 Credits**

Principles of Good Laboratory Practice Standards, methodology, utility and limitations of chemical forensic methods as applied to real investigations.

**Recommended:** One year of college chemistry and one term of organic chemistry.

## **TOX 599, SPECIAL TOPICS, 1-16 Credits**

*This course is repeatable for 16 credits.*

## **TOX 601, RESEARCH, 1-16 Credits**

*This course is repeatable for 16 credits.*

## **TOX 603, THESIS, 1-16 Credits**

*This course is repeatable for 999 credits.*

## **TOX 605, READING AND CONFERENCE, 1-16 Credits**

*This course is repeatable for 16 credits.*

## **TOX 607, SEMINAR, 1-16 Credits**

*This course is repeatable for 16 credits.*

## **TOX 611, TESTING FOR GENOTOXICITY, 4 Credits**

A lab-based course geared toward toxicology, biochemistry, biology, food science, nutrition, pharmacy and MCB students. Introduces principles and methods of several key assays used to screen for DNA damage and mutation. These tests will include the following: (i) Salmonella mutagenicity assay ('Ames test'), (ii) single cell gel electrophoresis ('comet') assay, (iii) micronucleus assay, and (iv) PCR-based single strand conformation polymorphism (SSCP) screening for oncogene/tumor suppressor gene mutation in cancers. This 2-week, intensive lab/lecture class runs Mon-Fri in the LPSC during the first session of summer term. Each day includes laboratory work and a 2-hour lecture covering basic principles of the assays, as well as technical details of the experiment for the day.

**Prerequisite:** TOX 514 with C or better

**Recommended:** BB 400 series, prior course work on DNA repair and mutagenesis

## **TOX 699, SPECIAL TOPICS, 1-16 Credits**

*This course is repeatable for 16 credits.*

## **TOX 808, WORKSHOP, 1-16 Credits**

*This course is repeatable for 16 credits.*