

Modified 1-2-1 curriculum. Second semester (freshmen) is first organic course.

Sample of toxicological principles described and discussed:

- Stereochemistry and Thalidomide
 - ✓ exposure, dose, dose/response
- Development of Teflon and Halogenated Compounds
 - ✓ environmental exposure, remediation, chemical disposal hazards
- Grilling Food and Polycyclic Aromatic Compounds
 - ✓ exposure routes, biological response, toxicokinetics/toxicodynamics
- Laboratory
 - ✓ MTT assay of fat-soluble vitamins

Moving Toxicology into Other Courses

- Second Semester Organic
 - ✓ Synthesis of drug compound, brine shrimp assay
 - ✓ EPI Suite activity
- Analytical
 - ✓ Green chemistry assessment
 - ✓ Extraction and analysis of environmental toxin
- Environmental Chemistry

Conclusion

Working toxicology material into existing course content provides an alternative to the addition of more coursework and helps develop an awareness of toxicological implications as part of the normal practice of chemistry.

Chemistry 484/584, Chemical Toxicology
Fall 2020

Instructors: Douglas E. Raynie
SAV 131-B
688-6361
douglas.raynie@sdstate.edu

Text: *National Institutes of Health ToxTutor*
(<https://tox.tutor.nlm.nih.gov/index.html>)
Additional articles of interest, posted on the course D2L site
<http://www.ehn.org>

Lecture: TTh, 8:00-9:15, SAV 280

Office Hours: To be announced

Objective: Understanding of the principles of toxicity, including the molecular basis for toxicity and the fate and transport of chemicals in the environment.

Resources

GCC Toxicology Working Group Modules

<https://toxtutor.nlm.nih.gov/>

<https://modrn.yale.edu/education/undergraduate-curriculum/green-chemistry-videos/toxicology>

Above the Fold (www.ehn.org)

Readings and Videos

ToxTutor is a self-paced tutorial covering key principles of toxicology for users of the National Library of Medicine (NLM) chemical and toxicology databases. While a knowledge of anatomy and physiology is not required for viewing ToxTutor, the [Introduction to the Human Body](#) from the National Cancer Institute provides a good introduction to the topic.

Continuing Education / Certificate of Completion

This course is approved for 3 contact hours for California Registered Environmental Health Specialists (REHSs) and National Environmental Health Association's (NEHA) REHS/RSs. To take the tutorial and receive a certificate, please [register and complete the tutorial](#) through our free learning management system.

ToxTutor is divided into the following sections:

1. [Introduction to Toxicology](#)
2. [Dose and Dose Response](#)
3. [Toxic Effects](#)
4. [Interactions](#)
5. [Toxicity Testing Methods](#)
6. [Risk Assessment](#)
7. [Exposure Standards and Guidelines](#)
8. [Basic Physiology](#)
9. [Introduction to Toxicokinetics](#)
10. [Absorption](#)
11. [Distribution](#)
12. [Biotransformation](#)
13. [Excretion](#)
14. [Cellular Toxicology](#)
15. [Intuitive Toxicology and Risk Communication](#)
16. [Environmental Toxicology, Environmental Health, and One Health](#)
17. [Conclusion](#)

Each section of ToxTutor contains one or more related content pages. The basic principles of toxicology described in ToxTutor are similar to those taught in university programs and are well described in toxicology literature. A list of the textbooks used as the primary resources for the tutorials is found in the [Bibliography](#).

	12 Topics:	Curriculum team:
1	The historical and practical interconnections of toxicology and green chemistry	Amy Cannon & John Warner
2	Fundamentals of toxicology and toxicodynamics	John Warner, Beyond Benign
3	Fundamentals of toxicokinetics	Dalila Kovacs, Anna Tarach, Grand Valley State Univ
4	Understanding hazard and risk	Saskia van Bergen, WA State Dept of Ecology
5	Reaction mechanisms – types of chemical reactions and their link to toxicity	John Warner, Beyond Benign
6	Target organ toxicity: mechanisms of action	Wendy Heiger-Bernays, Boston University School of Public Health
7	Toxicity of Metals	Nesta Bortey-Sam, Samantha Totoni, University of Pittsburgh
8	Environmental fate, persistence, and biodegradation	Karolina Mellor and Predrag Petrovic, Yale University
9	Environmental Toxicology	Nesta Bortey-Sam, Samantha Totoni, University of Pittsburgh
10	Ecotoxicology: Aquatic and Terrestrial Toxicity – focused on organisms	Bryan Brooks and Laura Langan, Baylor University
11	Predictive toxicology: Tools and strategies for predicting toxicity of chemicals	Jakub Kostal and Charlotte Snyder, George Washington University
12	Structure-activity relationships: How does structure impact function, and toxicity?	Adelina Voutchkova and Diana Ainembabzi, George Washington University
13	Designing for reduced toxicity: Case studies and approaches	Pam Spencer; Darrell Boverhof & Dow team; + 2 additional case studies