

Biology 358 – Toxicology

Course Description

This 4-credit course covers the principles of toxicology, the study of poisons. Topics include molecular and cellular sites of toxicant action, physiological effects of toxicants in mammalian systems and ecological systems, and the application of toxicology to public health and policy. Central toxicology concepts such as dose-response, mixtures, gene-environment interaction, and endocrine/reproductive toxicity will be explored in the laboratory culminating in student-designed research projects and scientific papers. This course fulfills speaking and writing within the major requirements. Lectures and laboratory. Prerequisites: Bio 151, Bio 152; and one of the following: Bio 255, Bio 262, Chem 241. It is recommended that students have completed Chem 152 or 201 before enrolling in this course.

Instructor: Dr. Stephanie Fretham

Office: Sampson Hoffland Laboratories 190B

Office Hours: By appointment

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Required Materials

- *Casarett & Doull's Essentials of Toxicology*, Second Edition (2010); Klaassen and Watkins
- *Dark Remedy*; Brynner and Stephens
- Bound Laboratory Notebook, available in Luther Book Store
- Semester License for Prism GraphPad software, available in Luther Book Store

Meeting Times

Lecture: 8-9 M,W,F; Valders 367

Lab: 11-2 Tuesdays; SHL 235

Course Objectives

After completing this course, you will be able to analyze and evaluate environmental and health concerns presented by toxic substances

- Define "toxicity" and describe methods used to assess toxicity
- Integrate core principles from chemistry, physiology, and environmental studies to characterize the biological impacts of toxins and contaminants on organic life
- Develop and evaluate an original hypothesis based on primary literature and experimental observation
- Effectively and accurately communicate scientific information through oral and written presentations
- Discuss the political, social, and ethical implications of toxicology within an historical context

Expectations for Students:

- Invest time and effort into the work of learning toxicology
- Respect your classmates and instructor by coming to lecture, lab, and scheduled meetings prepared and on time
- Silence and responsibly use electronics
- Complete individual and group work on time, including reading assignments
- Strictly adhere to all safety precautions and procedures in the lab
- Work cooperatively and collegially with your classmates

Expectations for Dr. Fretham:

- Challenge you intellectually
- Clearly communicate course expectations and policies
- Evaluate your work fairly and provide timely and constructive feedback
- Adhere to course schedule as much as possible
- Be available to answer questions and help you succeed in this course
- Address disruptive or dangerous behavior promptly

General Course Policies

Lecture Quizzes: Lecture quizzes and other in-class assessments will be taken as scheduled. If you have a conflict discuss it with me as soon as possible and no later than one week in advance for alternative arrangements. If an extenuating circumstance arises (severe illness or family emergency), contact me as soon as you can and we will arrange a solution.

Late Work: Make every effort to complete assignments on time. Work that is turned in late will be penalized 5% per day, including weekends. However, assignments discussed as a class will not be accepted as late work (ie paper summaries).

Accommodation of Individual Needs: Participants requiring disability, religious, cultural or other accommodations should discuss these needs with me as soon as possible. All discussions will remain confidential.

Luther College policy is to create learning environments responsive to all students. Students with disabilities that may affect participation in course activities or ability to meet course requirements are encouraged to arrange accommodations as soon as possible with the Disabilities Services Office (<http://www.luther.edu/disabilityservices/>; Room 108, Preus Library).

Academic honesty: The Honor Code states: *"We [the student body] therefore hereby resolve to uphold individually and collectively the honor of the college by doing all that is within our power to prevent any form of dishonesty in our academic work and our college life."*

While I encourage you to work together and share resources I expect **all exams and other assignments to be your own independent work unless otherwise specified**. Dishonesty, including but not limited to unauthorized use of outside materials or collaboration, plagiarism, and facilitation of others' dishonesty will not be tolerated and will be reported to the Honor Council. **If you have any hesitation about what constitutes plagiarism or inappropriate collaboration, ask before submitting your work.**

Laboratory Policies

1. Wear appropriate clothing and protective equipment at all times, especially when in the lab outside of scheduled class time, including lab coats and close-toed shoes.
2. Complete all safety training and documentation cheerfully and as required.
3. Respect the chemicals. Everything can be toxic, so exercise caution.
4. Absolutely no food, drink, gum, or any other consumable in the lab at any time (see #3).
5. Dispose of materials as directed, if unsure, ask.
6. Care for the equipment. Microscopes, incubators and other equipment including organisms and disposable tools are valuable resources financed by donations and tuition. Using them gently and as intended will prevent accidents and ensure that this and other courses remain available for future students. Please ask if you are unsure about proper equipment use.
7. Be aware of what is going on around you. Most accidents happen when a flame goes unnoticed, or a beaker is placed too close to the edge of the bench.
8. Keep the lab clean and neat. This includes putting away all equipment, chemicals, experimental samples and cleaning all dishes and benches promptly.

These policies are in place to ensure your safety, the safety of others, and environmentally responsible conduct. I do not tolerate reckless behavior or disregard of these policies, and violations will affect your grade and may lead to more severe disciplinary consequences.

Evaluation (*All assignments are to be completed individually unless otherwise noted*)

S indicates assessment of speaking

W indicates assessments of writing

Lecture

40pts (S/W): Paper Summaries and Discussion (10pts/each)

50pts: Lecture Worksheets and Assignments (~5pts/each)

100pts: Lecture Quizzes (25pts/each)

100pts: Cumulative Final Exam

Research Project

10pts: Project Proposal (with group)

5pts: Calendar (with group)

28pts: Weekly Check-Ins (4pts/each)

10pts (W): Introduction Draft

20pts (W): Methods and Results Draft (with group)

10pts (W): Discussion Draft

10pts (W): Peer Review of others' drafts

100pts (W): Final Paper

10pts (W): "Press Release" summary of project for general public

5pts: Self-Assessment of contribution to research project

25pts (S): Progress Report Discussion (with group)

14 pts (S): Progress Report Participation

50pts (S): Final Presentation (with group)

Other

30pts: Lab Books (10pts/each)

15pts (S): Research Symposium Participation and Discussion

Grades will be awarded based on the percentage of total points earned (632 possible)

93-100	A	87-89	B+	77-79	C+	67-69	D+
90-92	A-	83-86	B	73-76	C	60-66	D
		80-82	B-	70-72	C-	<59	F

Please Note: The syllabus serves as a guide for the semester, and as such I reserve the right to alter and amend the policies and assignments outlined here based on my own judgment and student input. Any changes will be discussed directly and promptly with the class.

Bio 358 Spring 2016 Course Schedule

Note: All major assignments are listed here, however there may be additional smaller assignments given during class

Date	
2/5 (F)	<p>Topic: Toxicology Overview. Concentrations and Serial Dilutions Reading: Chapter 1; Dark Remedy Ch 1-2 Assignment Due: None</p>
2/8 (M)	<p>Topic: Dose-Response, Animals Models Reading: Ch 2 (Pay particular attention to how dose-response curves are generated and what we can learn from them); Animal Research (KATIE, keep a pro/con list) Assignment Due: Serial Dilution WS</p>
2/9 (T)	<p><i>Daphnia magna</i> Reading/Assignment: See KATIE</p>
2/10 (W)	<p>Topic: Finding Primary Literature Reading: None Assignment Due: Dose-Response WS, Bring Laptop, In-Class Worksheet</p>
2/12 (F)	<p>Topic: Reading Primary Literature Reading: See KATIE Assignment Due: None</p>
2/15 (M)	<p>Topic: Dose-Response, Mechanisms of Toxicity Reading: Ch 3 p21-27 through Step 2 (Be able to define the terms illustrated in Fig 3-2) Assignment Due: Paper Summary, Lab Book (in class, see KATIE);</p>
2/16 (T)	<p>Seed Germination Reading/Assignment: See KATIE</p>
2/17 (W)	<p>Topic: Mechanisms of Toxicity Reading: Ch 3 p27-44, Steps 3 and 4 (Note how all the pieces interact to generate toxicity) Assignment Due: None</p>
2/19 (F)	<p>Topic: Absorption, Distribution, Excretion Reading: Ch 5 (Add more detail to the Mechanisms of Toxicity diagram) Assignment Due:</p>
2/22 (M)	<p>Topic: Quiz 1 Reading: Schwartz, 2008 (KATIE) Assignment Due: Lab Book (in class, see KATIE)</p>
2/23 (T)	<p><i>Caenorhabditis elegans</i> Reading/Assignment: Schwartz Response; See KATIE</p>
2/24 (W)	<p>Topic: Biotransformation Reading: Ch 6 p71-89 (Pay particular attention to Cytochrome P450, p80-89) Assignment Due: None</p>
2/26 (F)	<p>Topic: Biotransformation Reading: Ch 6 p89-96; Dark Remedy Ch 3 Assignment Due: Lab Book (in class, see KATIE)</p>
2/29 (M)	<p>Topic: Journal Club Reading: See KATIE Assignment Due: Paper Summary</p>
3/1 (T)	<p>Research Project Reading/Assignment: Proposal Due at 11:00, sign up for group meetings</p>
3/2 (W)	<p>Topic: Neurotoxicity Reading: Ch 16 Assignment Due: None</p>
3/4 (F)	<p>Topic: Neurotoxicity Reading: Ch 16 Assignment Due: Research Project Calendar</p>
3/7 (M)	<p>Topic: Metals Reading: Ch 23 Assignment Due: None</p>

3/8 (T)	Research Project Reading/Assignment: Check-In
3/9 (W)	Topic: Journal Club Reading: See KATIE Assignment Due: Paper Summary
3/11 (F)	Topic: Quiz 2 Reading: None Assignment Due: None
3/14 (M)	Topic: Liver Reading: Ch 13 (Omit "Structural Organization" (p178) and skim p181-183, be able to define each type of damage, read p183-188 closely, note roles of biotransformation in toxicity) Assignment Due: None
3/15 (T)	Research Project Reading/Assignment: Check-In
3/16 (W)	Topic: Liver Reading: Ogilvie, 2012 and Acetylcysteine Information (KATIE) Assignment Due: None
3/18 (F)	Topic: Progress Update Reading: None Assignment Due: In Class Update Worksheet
3/21-28	Spring Break
3/29 (T)	Research Project Reading/Assignment: Check-In
3/30 (W)	Topic: Risk Assessment Reading: Ch4 (Omit Dose-Response Assessment, p51-53), Dark Remedy Ch 4-6 Assignment Due: Dark Remedy Response
4/1 (F)	Topic: Progress Update Reading: None Assignment Due: In Class Update Worksheet, Introduction Draft (6pm)
4/4 (M)	Topic: NO LECTURE , Forensic Toxicology Reading: Poisoner's Handbook (video) Assignment Due: None
4/5 (T)	Research Project Reading/Assignment: Check-In (via email before 6pm)
4/6 (W)	Topic: NO LECTURE , Forensic Toxicology Reading: Poisoner's Handbook (video) (you may want to start Friday's reading) Assignment Due: Poisoner's Handbook Response (6pm)
4/8 (F)	Topic: Forensic Toxicology Reading: Dark Remedy Ch 7-9 Assignment Due: Dark Remedy Response
4/11 (M)	Topic: Progress Update Reading: None Assignment Due: In Class Update Worksheet, Methods/Results Draft (6pm)
4/12 (T)	Research Project Reading/Assignment: Check-In
4/13 (W)	Topic: Quiz 3 Reading:; See KATIE Assignment Due: None
4/15 (F)	Topic: Progress Updates Reading: None Assignment Due: In Class Update Worksheet, Peer Review
4/18 (M)	Topic: Endocrine and Reproductive Toxicology Reading: Ch 10 (especially Fig 10-2, keep Mechanisms of Toxicity in mind) Assignment Due:
4/19 (T)	Research Project Reading/Assignment: Check-In

4/20 (W)	Topic: Journal Club Reading: See KATIE Assignment Due: Paper Summary and Aviv Response
4/22 (F)	Topic: NO LECTURE , Data Workshop (Dr. Fretham will be in lab from 8-12 for data analysis help) Reading: Assignment Due:
4/25 (M)	Topic: Pesticides Reading: Ch 22 (p317-320, note pros and cons of each compound) Assignment Due: Discussion Draft (6pm)
4/26 (T)	Research Project Reading/Assignment: Check-In, Sign Up for Feedback Meetings (4/30-5/1)
4/27 (W)	Topic: Pesticides Reading: Ch 22 (p310-317, note pros and cons of each type of insecticide) Assignment Due: None (Senior Projects due at 5pm)
4/29 (F)	Topic: Quiz 4 Reading: Dark Remedy Ch 10-11 Assignment Due: None
5/2 (M)	Topic: Venoms Reading: Ch 26, Brodie III, 2009 (KATIE) Assignment Due: None
5/3 (T)	TBA Reading/Assignment: Clean Lab
5/4 (W)	Topic: Clinical Toxicology Reading: Ch 32, Porter, 2012 (KATIE, only "Introduction and Clinical Toxicology") Assignment Due: Final Paper (6pm)
5/6 (F)	Topic: No Lecture , Student Research Symposium Reading: None Assignment Due: Observations (5pm)
5/9 (M)	Topic: Symposium Discussion Reading: None Assignment Due: None
5/10 (T)	Project Presentations
5/11 (W)	Topic: Public Communication and Policy Reading: Dark Remedy Ch 12-13 Assignment Due: None
5/13 (F)	Topic: TBD Reading: See KATIE Assignment Due: Press Release and Self-Assessment
5/16 (M)	10:15-12:15 Final Exam