



THE UNIVERSITY OF
TENNESSEE
KNOXVILLE

BIG ORANGE. BIG IDEAS.

EEB 461/593 Environmental Toxicology, Fall 2016

University of Tennessee, Knoxville

Course Section: Sec 003 (EEB 461) or Sec 006 (EEB 593)

Meeting Time and Place: 6:30 to 7:45 pm, Tuesday and Thursday, Dabney-Buehler Hall 488

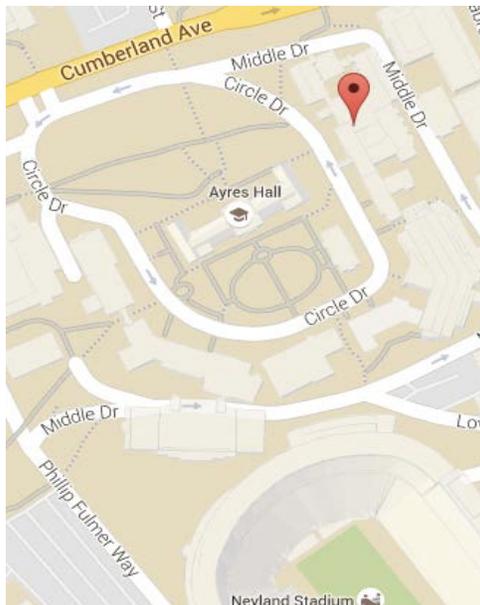
Course Credit Hours: 3

Faculty Contact Information

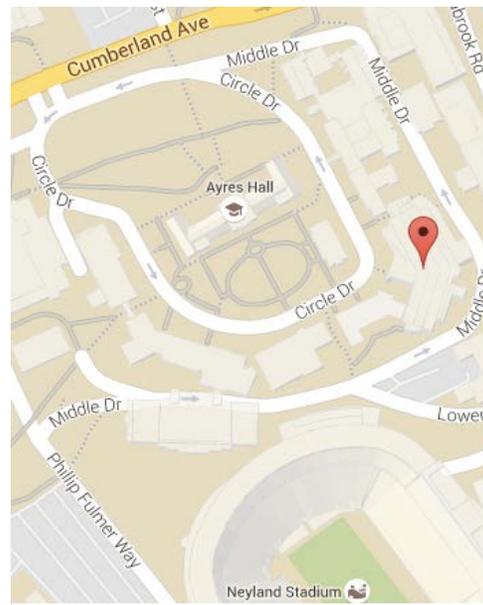
Contact instructor, Dr. Christy Leppanen, via email at cleppane@utk.edu or during office hours:

TTH 4-5 pm in SERF 415 or by appointment. Students will receive a response to email inquires within 72 hrs.

For technical issues, contact OIT at <http://help.utk.edu/footprints/contact>.



Course Location: Dabney-Buehler Hall



**Office Hours Location: SERF
(Science and Engineering Research Facility)**

Course Description/Information:

Environmental Toxicology is the study of the fate and effects of chemicals in the environment. A multidisciplinary field, it includes considerations of naturally occurring toxic chemicals, such as animal venom and plant toxins, but focuses more so on the study of environmental chemicals originating from human activity. Recommended background: Introductory Biology, Organic Chemistry

NOTE: BIOL 280 is NOT a required prerequisite. Contact instructor to override BIOL 280 requirement.

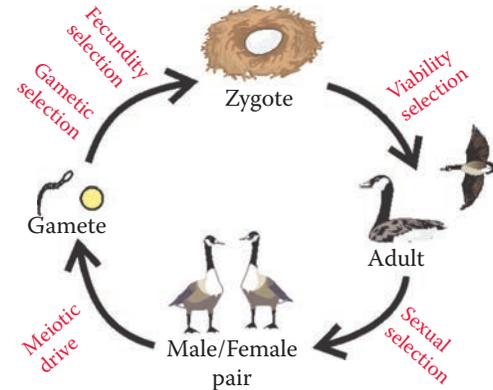
Value Proposition:

This course provides students with an appreciation and understanding of the principles of toxicology, using historic and contemporary case studies to emphasize how chemicals in the environment interact with biotic and abiotic factors to influence individuals, populations, communities, and ecosystems. Completion of this course complements a diverse group of degree programs and careers (e.g., science, engineering, public health, and policy) while imparting an environmental awareness that serves students well outside their professional endeavors.

Student Learning Outcomes/Objectives:

Successful completion of this course will allow students to:

- Describe the fundamental principles of toxicology and ecotoxicology
- Apply these principles to chemical fate and effects in organisms and the environment
- Acquire, evaluate, connect, and utilize scientific information and principles to investigate the effects of environmental contaminants
- Critically evaluate environmental toxicology topics in the media
- Make informed personal decisions about chemical exposure



Components of the life cycle of an individual in which natural selection can occur. Although rarely considered, selection components can be acted upon by contaminants. (Newman Fig 10.14)

Learning Environment:

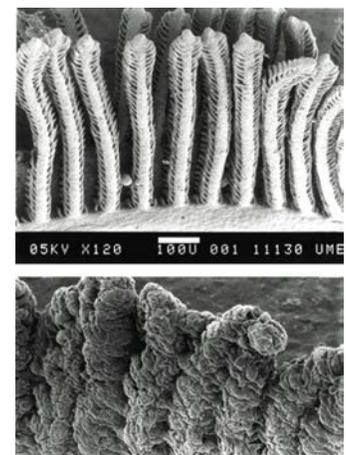
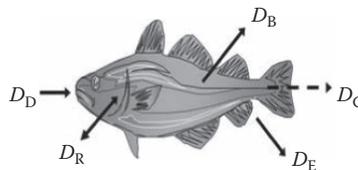
Fundamental, background course material will be presented in lectures and readings. Case studies presented by students and guest lecturers will be used to further consider fundamentals as they apply in a variety of well-known and current topics in environmental toxicology. Student performance will be evaluated in two exams, summaries and presentations of case studies, and a comprehensive round-table discussion about priorities in environmental toxicology policy, regulation, research, and education.

Student's Responsibility

- Be prepared for all classes, read assigned materials BEFORE each class
- Be respectful of others
- Actively contribute to the learning activities in class
- Abide by the UT Honor Code

Instructor's Responsibility

- Be prepared for all classes
- Evaluate all fairly and equally
- Be respectful of all students
- Create and facilitate meaningful learning activities
- Behave according to University codes of conduct



Electron micrographs of gills from Atlantic salmon fry. Top panel = normal morphology; bottom panel = morphology after 30 days exposure to $300 \mu\text{g}\cdot\text{L}^{-1}$ of aluminum. (Newman Fig 7.9)

Required Textbook:

Fundamentals of Ecotoxicology: The Science of Pollution, Fourth Edition, 2015, by Michael C. Newman. Published by CRC Press, Taylor & Francis Group, Boca Raton, FL. 654 pgs.

EEB 461/593 Environmental Toxicology Course Schedule:

INTRODUCTION: WHY STUDY TOXICOLOGY? WHY IS IT IMPORTANT?

TH 18 Aug	Course Introduction/Syllabus	
TU 23 Aug	Introduction to Environmental Toxicology	Read CH 1 (Peek @ CH 13 & 14)

BACKGROUND INFORMATION: CONTAMINANTS? WHAT CONTAMINANTS?

TH 25 Aug	Background Chemistry Concepts and Definitions	Read CH 2 pgs 94-98
	Major Classes of Contaminants	Read CH 2 pgs 33-42
TU 30 Aug	...continued	Read CH 2 pgs 43-70
TH 1 Sept	ADMINISTRATIVE CLOSING	NO CLASS
TU 6 Sept	...continued	Read CH 2 pgs 70-94

IN, OUT, AND IN BETWEEN: HOW DO CHEMICALS MOVE IN AND OUT OF ORGANISMS?

TH 8 Sept	Update, Biotransformation Detoxification, Elimination, and Accumulation	Read CH 3 pgs 99-127
TU 13 Sept	Factors Influencing Bioaccumulation	Read CH 4 pgs 129-155
TH 15 Sept	Bioaccumulation from Food and Trophic Transfer	Read CH 5 pgs 157-180

CASE STUDIES

TU 20 Sept	Contaminant Case Studies presented by Students	Worksheet #1 Due
TH 22 Sept	Contaminant Case Studies presented by Students	

EFFECTS: CHEMICALS GET IN – SO WHAT? WHAT HAPPENS WHEN THEY DO?

TU 27 Sept	Molecular Effects and Biomarkers	Read CH 6 pgs 181-208
TH 29 Sept	Cells, Tissues, and Organs	Read CH 7 pgs 209-234
TU 4 Oct	MID-TERM EXAM	
TH 6 Oct	Fall Break	NO CLASS
TU 11 Oct	Sublethal Effects to Individuals	Read CH 8 pgs 235-260
TH 13 Oct	...continued	Read CH 8 pgs 260-274
TU 18 Oct	Acute and Chronic Lethal Effects to Individuals	Read CH 9 pgs 275-304

IMPACTS: WHAT EFFECTS DO CHEMICALS HAVE BEYOND THE ORGANISM?

TH 20 Oct	Dr. Frank Löffler, UT & Oak Ridge National Laboratory	Reading TBA
TU 25 Oct	Effects on Populations	Read CH 10 pgs 305-342
TH 27 Oct	Effects to Communities and Ecosystems	Read CH 11 pgs 343-375
TU 1 Nov	Landscape to Global Effects	Read CH 12 pgs 377-396

RESEARCH, REGULATION, AND MANAGEMENT: WHAT CAN WE DO ABOUT IT?

TH 3 Nov	Risk Assessment of Contaminants Environmental Laws and Regulations	Read CH 13 pgs 397-423 Skim Appendices 3-8
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CASE STUDIES

TU 8 Nov	Contaminant Case Studies presented by Students	Worksheet #2 Due
TH 10 Nov	Contaminant Case Studies presented by Students	
TU 15 Nov	Dr. Sylvia Milanez, Oak Ridge National Laboratory	Reading TBA
TH 17 Nov	Dr. Mark Greeley, Oak Ridge National Laboratory	Reading TBA
TU 22 Nov	STUDY DAY	NO CLASS
TH 24 Nov	Thanksgiving Break	NO CLASS
TU 29 Nov	ROUND-TABLE DISCUSSION	
TU 6 DEC	FINAL EXAM (7:15 pm – 9:15 pm)	

Course Requirements, Assessments, and Evaluations:

STUDENT CASE STUDIES (40% of grade)

Each student will choose a contaminant that they will follow throughout the course, alongside course material. Provided two worksheets that query for information about their contaminant, students will collect information, for example, about its chemical class, mode of action, target and non-target effects, regulation, and media coverage. Students will share the information that they collect with the class via these two worksheets and in two, 15-minute presentations, the points that they find the most interesting. Presentations should expand upon and discuss one or several particular points the student finds interesting and not strictly mirror information summarized in worksheets.

MID-TERM AND FINAL EXAMS (50% of grade)

Exams will focus on information that is presented in class in: 1) lectures and 2) case studies presented by students and guest lecturers. Lectures are a distillation of reading assignments supplemented by a variety of case studies that exemplify many of the same points. The more time spent or emphasis on a particular point, the more important it is for your grasp of course concepts, the more likely that information will appear on an exam. Please note:

- In the textbook, "vignettes" expand upon basic information provided in each chapter. Although students are encouraged to read vignettes, information in vignettes will only be included on exams when presented in class and/or specifically assigned. In either case, vignettes included on exams will be clearly indicated.
- Students will be provided a copy of all Case Study Worksheets.
- Students will be provided reading material and a summary worksheet before each guest lecture.
- Each exam will include multiple choice, matching, true/false, short answer, and 2-3 essay questions.

ROUND-TABLE DISCUSSION (10% of grade)

At the end of the semester, all students will participate in a ROUND-TABLE DISCUSSION about priorities in environmental toxicology policy, regulation, research, and education. Students should come to class prepared to serve as their contaminant's "class expert," considering its history from discovery to current use alongside information presented by other students, the instructor, and guest lecturers.

Attendance Policy:

Attendance is mandatory during CASE STUDIES and the ROUND-TABLE DISCUSSION (20 Sept, 22 Sept, 20 Oct, 8 Nov, 10 Nov, 15 Nov, 17 Nov, 29 Nov); failure to attend on these dates may result in up to a 3-point deduction in your final grade PER SCHEDULED CLASS that is missed. Attendance during other lectures is not mandatory but strongly encouraged.

Late Assignments:

Up to 3 points may be deducted FOR EACH DAY (including weekends) an assignment is turned in late.

Important Dates:

10% of grade **TU 20 Sept**

- CASE STUDY Worksheet #1 is due by the beginning of class on 20 Sept

10% of grade **TU 20 Sept OR TH 22 Sept**

- Each student will give a 15 min presentation of select information from their CASE STUDY Worksheet #1

25% of grade **TU 4 Oct**

- The MID-TERM EXAM will cover CH 1-7 assigned readings, associated information provided in lectures from 23 Aug through 29 Sept, as well as CASE STUDIES presented on 20 Sept and 22 Sept

10% of grade **TU 8 Nov**

- CASE STUDY Worksheet #2 is due by the beginning of class on 8 Nov

10% of grade **TU 8 Nov OR TH 10 Nov**

- Each student will give a 15 min presentation of select information from their CASE STUDY Worksheet #2

10% of grade **TU 29 Nov**

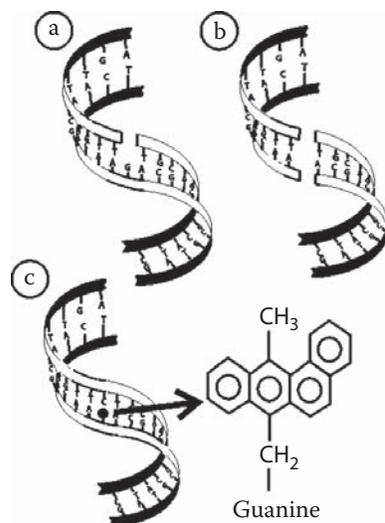
- All students will participate in a ROUND-TABLE DISCUSSION about priorities in environmental toxicology policy, regulation, research, and education

25% of grade **TU 6 Dec**

- The FINAL EXAM will cover CH 8-13 assigned readings, associated information provided in lectures from 11 Oct through 3 Nov, as well as CASE STUDIES presented on 20 Oct, 8 Nov, 10 Nov, 15 Nov, and 17 Nov

Grading Scale:

Grades scored between	97% and 100% will equal	A+
	94% and less than 97% will equal	A
	90% and less than 94% will equal	A-
	87% and less than 90% will equal	B+
	84% and less than 87% will equal	B
	80% and less than 84% will equal	B-
	77% and less than 80% will equal	C+
	74% and less than 77% will equal	C
	70% and less than 74% will equal	C-
	67% and less than 70% will equal	D+
	64% and less than 67% will equal	D
	60% and less than 64% will equal	D-
	0% and less than 60% will equal	F



Various types of damage can occur to DNA due to toxicants. Toxicants or free radicals can produce (a) single- or (b) double-strand breaks. (c) Xenobiotics or their metabolites may react with bases to form adducts. (Newman Fig 6.4)

The instructor reserves the right to revise, alter, or amend this syllabus as necessary. Students will be notified in writing and/or electronic communication of any such changes.

Dear Student,

The purpose of this Campus Syllabus is to provide you with important information that is common across courses at UT. Please observe the following policies and familiarize yourself with the university resources listed below. At UT, we are committed to providing you with a high quality learning experience.

I wish you the best for a successful and productive semester.

Provost Susan Martin



UNIVERSITY CIVILITY STATEMENT

Civility is genuine respect and regard for others: politeness, consideration, tact, good manners, graciousness, cordiality, affability, amiability and courteousness. Civility enhances academic freedom and integrity, and is a prerequisite to the free exchange of ideas and knowledge in the learning community. Our community consists of students, faculty, staff, alumni, and campus visitors. Community members affect each other's well-being and have a shared interest in creating and sustaining an environment where all community members and their points of view are valued and respected. Affirming the value of each member of the university community, the campus asks that all its members adhere to the principles of civility and community adopted by the campus: <http://civility.utk.edu/>.

ACADEMIC INTEGRITY

“An essential feature of the University of Tennessee, Knoxville is a commitment to maintaining an atmosphere of intellectual integrity and academic honesty. As a student of the university, I pledge that I will neither knowingly give nor receive any inappropriate assistance in academic work, thus affirming my own personal commitment to honor and integrity.”

DISABILITIES THAT CONSTRAIN LEARNING

“Any student who feels he or she may need an accommodation based on the impact of a disability should contact the Office of Disability Services (ODS) at 865-974-6087 in 2227 Dunford Hall to document their eligibility for services. ODS will work with students and faculty to coordinate reasonable accommodations for students with documented disabilities.”

YOUR ROLE IN IMPROVING TEACHING AND LEARNING THROUGH COURSE ASSESSMENT

At UT, it is our collective responsibility to improve the state of teaching and learning. During the semester, you may be requested to assess aspects of this course either during class or at the completion of the class. You are encouraged to respond to these various forms of assessment as a means of continuing to improve the quality of the UT learning experience.

KEY RESOURCES FOR STUDENTS:

- Undergraduate Catalogs: <http://catalog.utk.edu> (Listing of academic programs, courses, and policies)
- Graduate Catalog: <http://catalog.utk.edu/index.php?catoid=2>
- Hilltopics: <http://dos.utk.edu/hilltopics> (Campus and academic policies, procedures and standards of conduct)
- Course Timetable: https://bannersb.utk.edu/kbanpr/bwckschd.p_disp_dyn_sched (Schedule of classes)
- Academic Planning: <http://www.utk.edu/advising> (Advising resources, course requirements, and major guides)
- Student Success Center: <http://studentsuccess.utk.edu> (Academic support resources)
- Library: <http://www.lib.utk.edu> (Access to library resources, databases, course reserves, and services)
- Career Services: <http://career.utk.edu> (Career counseling and resources; HIRE-A-VOL job search system)