

**Course Website:** <http://www.webs.uidaho.edu/che480>

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**Course Description:**

The cleanup of hazardous waste sites is largely driven by an assessment of human health and the environment. This course examines risk assessment for quantitative and qualitative approaches to characterizing and controlling environmental pathways between contaminants and human receptors. Both non-radioactive and radioactive chemicals are covered. Engineers and scientists working in waste management will develop proficiency in and awareness of the theory and practice of toxicology, exposure assessment and risk characterization.

**Prerequisites:**

Required: Upper division (480) or graduate (580) status in engineering or science.  
 Recommended: a course in Hazardous Waste Management (ChE 470); an introductory biology course (UI Biol 201) or equivalent.

**Recommended Reading/Reference:**

There is no textbook for this course; the following reading is recommended.  
*Essentials of Environmental Toxicology*, by W. William Hughes, another basic toxicology book, or the following online tutor: <http://sis.nlm.nih.gov/ToxTutor/Tox1/index.html>

**Grading Breakdown:**

	<u>480 Students</u>	<u>580 Students</u>
Toxicity Paper	10%	10%
Case Study Paper	10%	10%
Homework	10%	0%*
Journal Article Reviews	0%	20%
Exams #1 and #2	40%	30%
Final Exam	30%	30%

\*Graduate students are not required to turn in the homework assignments. However, it is highly encouraged that they be familiar with the assignment materials for the tests.

Because I am continuously upgrading this web course, your feedback is encouraged. Up to an additional 3% will be added to your grade as a bonus for your thoughtful and thorough critiques of the web format (submitted to the instructor via email) throughout the semester.

**Class Location/Format:**

This class is entirely Internet-based. There will be no class meetings. Lectures and supplemental materials are found at the website above. There will be discussion during this course with participation by the instructor and the TA. Instructions for accessing the discussion are located on the website.

## Class Schedule

August 25	Get acquainted with website and email instructor with a preferred address New Student Surveys Course Introduction
September 1	Labor Day Introduction to Risk Assessment (RA) Hazard Identification
September 8	Intro to Toxicity Assessment Bunker Hill Superfund Site – Part I Bunker Hill Superfund Site – Part II
September 15	Toxicity Assessment – Non-Radioactive I Toxicity Assessment – Non-Radioactive II Toxicity Assessment – Radioactive I
September 22	Toxicity Assessment - Radioactive II Hazardous Waste Cleanup in the Russian Far East Dose Response -Non-Radioactive
September 29	Dose Response – Non-Carcinogens I Dose Response – Non-Carcinogens II <b>Selection of Chemical – DUE by Friday, Oct. 3</b> <b>Selection of Case Study Topic – DUE by Friday, Oct. 3</b>
October 6	Dose Response – Carcinogens Lead (Pb) Risk Assessment Mutagens, Carcinogens, and Teratogens
October 13	Dose Response – Radionuclides Exposure Assessment I <b>Take Home Exam 1 - DUE by Friday, Oct. 17</b>
October 20	Exposure Assessment II Exposure Assessment III
October 27	Uncertainty and Variability Environmental Justice <b>Case Study Papers may be submitted by Oct. 31 for review - Optional</b>
November 3	Risk Exercises Environmental Release of Selenium <b>1st Journal Article Review - DUE by Friday, Nov. 7</b>
November 10	Epidemiology Concepts Epidemiological Studies
November 17	Hanford Environmental Dose Reconstruction <b>Case Study Papers - DUE by Wednesday, Nov. 19</b> <b>Take Home Exam 2 - DUE by Friday, Nov. 21</b>
November 24	<i>Fall Recess – No Classes</i>

December 1

Risk Communication

**Toxicity Paper - DUE by Friday, Dec. 5**

**2nd Journal Article Review - DUE by Friday, Dec. 5**

December 8 & 15

**Take Home Final Exam – DUE by Tuesday, Dec. 16**

## Writing Assignments

**Case Study Papers:** Each student (480 and 580) is required to write a case study paper. There is much confusion in today's society because of our knowledge (or lack thereof) about risks. Select a topic and research information from scientific journals, Internet sites, the popular press, etc., to share with the class. Write a paper on what is known about the health risks associated with the topics. You may present an unbiased overview, including various opinions that may exist; or you may take a biased position and defend it. Make your selection from the following list (or choose your own topic):

### Case Study Topics:

Agent Orange	Fat substitutes (olestra)
Alar	Food preservatives (pick one)
Artificial sweeteners (pick one)	Formaldehyde in building materials
Cell phones	Gulf War Syndrome
Plasticizers (phthalates)	Household insecticides (pick one)
Cleaning products (pick one)	Household weed killers (pick one)
Cooking with plastic food wraps	Microwave ovens
Cosmetics	Radio towers (EMF)

The completed case study papers will be made available to the class as required reading. Selection of the case study topic is due by October 3. Selection of a case study topic not included in the list above is subject to the instructor's approval. A rough draft of the case study paper may be submitted by October 31 if you would like it to be reviewed – the rough draft is not required. The final paper is due November 19. Papers will be graded on content and coverage of the subject; grammar and spelling; format and organization; and references. Papers are required to be 8-10 double-spaced pages and should generally follow this outline: abstract, table of contents, the main body of the report (including introduction, the body of the paper with well-organized and defined divisions, and conclusion), bibliography for cited references.

**Toxicity Paper:** Each student (480 and 580) must select one chemical on which to write a research paper. Selection of the chemical is due by October 3 and is subject to the instructor's approval. Ask the instructor for a suggestion if you are having trouble selecting a chemical. The paper is due by December 5. Papers will be graded as described above. Papers are required to be 12-15 double-spaced pages and must contain:

The main body of the report should address these items:

- Name: What are its synonyms, chemical formulae and Chemical Abstract Services (CAS) number?
- Occurrence: How does the pollutant enter the environment? Is it found naturally?
- Use: What is it used for? How may workers and the general public be exposed?
- Toxic Effects: What is the nature of the effects produced? How have they been demonstrated?
- Sensitive Populations: Are there groups at risk due to factors such as age, disease condition, or gender?
- Existing/Proposed Guidelines and Standards: Are there Reference Doses, Slope Factors, drinking water standards, air quality standards, etc., for this chemical?

**Journal Article Reviews:** Students in the 580 section of this course are required to complete 2 journal article reviews. Select a peer-reviewed article from the risk assessment literature (such as Environmental Science and Technology or Risk Analysis). Develop a critical review of the paper describing its strengths and weaknesses. You should not repeat what is in the paper, but demonstrate that you understood its contents. Reviews should be 6-8 pages, double-spaced. One review is due by November 7, another by December 5.

Your paper should follow this format:

- Introduction: subject background; review of subject background to describe paper's context
- Discussion: critical evaluation of the paper; how well are the assumptions justified? Is it well-written? Are the analyses clear? If you are reviewing a paper describing a mathematical model, for example, what are the model's applications? Are the model results verified?
- Supplemental Sections: if the full-text paper is available online, include a link, if not, Fax a copy of the paper to the instructor; include a list of references used to support the discussion