I. Course Description

This course is designed for students who are interested in public health, environmental issues, and the environmental basis of human disease. The major focus is learning the basic principles of toxicology, and how toxicology is used to understand how humans respond to chemical, biological, and physical agents in the environment. This course covers dose-response relationships, physiological responses to toxicants, and the application of toxicology to protect human health through safety evaluation and risk assessment.

II. Course Prerequisites

Basic science coursework. Coursework in biology, chemistry, and biochemistry is particularly helpful.

III. Course Goals and Objectives

• Understand the principles of environmental health risk assessment and how they are used for safety evaluation
• Learn how behavior, lifestyle, and personal characteristics, such as diet and genetics, affect how humans respond to environmental toxicants
• Practice retrieving toxicology information from national databases and predictive toxicology programs, and applying that information for safety assessment
• Practice problem solving with colleagues who have different backgrounds and areas of expertise
• Practice presenting information on environmental health issues
IV. Methods of Instruction and Work Expectations

Interdisciplinary, collaborative teams are required to address complex environmental health issues. Therefore, this course incorporates a “team-based learning” format, which gives students experience working as part of an interdisciplinary team.

The course takes place in a SCALE-UP-style classroom, which is designed for collaborative student work. SCALE-UP stands for Student-Centered Active Learning Environment with Upside-down Pedagogies. The classroom is equipped with circular tables for each team, microphones, whiteboards, and wall monitors. The University of Minnesota has the largest SCALE-UP classroom building in the world. Please note: If you are a Mac user, you will need to bring an adapter if you want to project onto the wall monitor.

The course includes lectures, assignments, in-class exercises, a poster presentation, and exams. Grading percentages are based on total performance on exams and assignments. Extra credit projects will not be accepted to improve a grade or as a substitute for an exams or assignments. The curve may be adjusted depending on the overall performance of the class (see Grading Criteria below).

Course grades will be determined by the following:

Team Work (45%)
- Hazard Identification Part I (20%)
- Hazard Identification Part II (5%)
- Poster presentation (20%)

Individual Work (55%)
- Quizzes (40%)
- Poster presentation evaluation (10%)
- Team participation/contribution (5%)

V. Course Text and Readings

One copy of each of the books listed below is available on reserve at the Biomedical Library or online.

Required textbook:

Required journal articles:


Additional texts:
Essentials of Environmental Toxicology. The Effects of Environmentally Hazardous Substances on Human Health by W. William Hughes. This is a useful textbook for more basic descriptions of toxicology concepts.

Casarett and Doull’s Toxicology. The Basic Science of Poisons by Curtis D. Klaasen. This is a useful reference for more in depth descriptions of toxicology concepts. This reference is available online through the University of Minnesota Biomedical Library.
Highly recommended reading:

*Dark Remedy. The Impact of Thalidomide and its Revival as a Vital Medicine.* By Trent Stephens and Rock Brynner. This a true story about a major toxicological disaster that occurred in Europe and Canada, and how a smart, brave toxicologist prevented this from happening in the U.S.

*How Everyday Products Make People Sick. Toxins at Home and in the Workplace.* By Paul D. Blanc. This book describes fascinating cases of environmental health issues that have occurred throughout history. See the *Scientific American* interview with Paul Blanc by Nicholette Zeliadt, U of M Environmental Health Program graduate: [http://www.scientificamerican.com/article.cfm?id=are-everyday-consumer-products-making-people-sick](http://www.scientificamerican.com/article.cfm?id=are-everyday-consumer-products-making-people-sick)

*In the Womb’s Shadow. The theory of prenatal programming as the fetal origin of various adult diseases is increasingly supported by a wealth of evidence.* By Silvia Fabiole Nicoletto and Andrea Rinaldi. EMBO reports. 2011. Volume 12. pp. 30-34. Available online through the Bio-Med Library.

**Useful Web Sites**

Environmental Health News:  
[http://www.environmentalhealthnews.org/](http://www.environmentalhealthnews.org/)


National Center for Environmental Assessment: [http://cfpub.epa.gov/ncea/](http://cfpub.epa.gov/ncea/)


U.S. Department of Health & Human Services, Specialized Information Services, Toxicology Information:  

Minnesota Department of Health, Division of Environmental Health:  
[http://www.health.state.mn.us/divs/eh/](http://www.health.state.mn.us/divs/eh/)

National Institutes of Health Office of Laboratory Animal Welfare:  


Scitable: Basic information about genetics and cell biology provided by the Nature Publishing Group  
[http://www.nature.com/scitable](http://www.nature.com/scitable)
VI. Course Outline/Weekly Schedule

Please note: If you miss a class, you are responsible for getting class notes from another student in class. The lecture presentations will not be posted on the Moodle site or distributed in class.

**Tuesday, October 23: Introduction to toxicology: prediction and prevention**

**Reading:**
- **Required:** *Principles and Practice of Toxicology in Public Health*, Chapters 1 – 6, 18 and 19

**Additional:** *Essentials of Environmental Toxicology*, Chapters 1 - 3; *Casarett and Doull’s Toxicology. The Basic Science of Poisons*, Unit 1.

**Thursday, October 23: Fundamentals of toxicology studies: the dose makes the poison**

**Reading:**
- **Required:** *Principles and Practice of Toxicology in Public Health*, Chapters 18 - 24;

**Additional:** *Essentials of Environmental Toxicology*, Chapters 2 and 3; *Casarett and Doull’s Toxicology. The Basic Science of Poisons*, Unit 1: Principles of Toxicology.

**Tuesday, October 30: Fundamentals of toxicology studies: the dose makes the poison**

**Reading:**
- **Required:** *Principles and Practice of Toxicology in Public Health*, Chapters 18 - 24;

**Additional:** *Essentials of Environmental Toxicology*, Chapters 2 and 3; *Casarett and Doull’s Toxicology. The Basic Science of Poisons*, Unit 1: Principles of Toxicology.

**Assignments:** Receive Team Assignment Part I

**Quiz 1**

**Thursday, November 1: Fundamentals of toxicology studies: the dose makes the poison**

**Reading:**
- **Required:** *Principles and Practice of Toxicology in Public Health*, Chapter 23

**Additional:** *Essentials of Environmental Toxicology*, Chapter 10; *Casarett and Doull’s Toxicology. The Basic Science of Poisons*, Unit 1: Risk Assessment.

**Assignments:** Work on Hazard ID of fracking chemicals with Team
<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Reading</th>
<th>Additional</th>
<th>Assignments</th>
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<tbody>
<tr>
<td>Tuesday, November 6</td>
<td>The application of toxicology to safety evaluation and risk assessment: what is safe?</td>
<td>Required: <em>Principles and Practice of Toxicology in Public Health</em>, Chapter 23</td>
<td>Essentials of Environmental Toxicology, Chapter 10; Casarett and Doull’s Toxicology. The Basic Science of Poisons, Unit 1: Risk Assessment.</td>
<td>Assignments: Work on Hazard ID of fracking chemicals with Team</td>
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<tr>
<td>Thursday, November 8</td>
<td>The application of toxicology to safety evaluation and risk assessment: what is safe?</td>
<td>Required: <em>Principles and Practice of Toxicology in Public Health</em>, Chapter 23</td>
<td>Essentials of Environmental Toxicology, Chapter 10; Casarett and Doull’s Toxicology. The Basic Science of Poisons, Unit 1: Risk Assessment.</td>
<td>Quiz 2. Assignments: Work on Hazard ID of fracking chemicals with Team.</td>
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<tr>
<td>Tuesday, November 13</td>
<td>The application of toxicology to safety evaluation and risk assessment: what is safe?</td>
<td>Required: <em>Principles and Practice of Toxicology in Public Health</em>, Chapters 7 – 9</td>
<td>Essentials of Environmental Toxicology, Chapters 4 - 6; Casarett and Doull’s Toxicology. The Basic Science of Poisons, Unit 2: Absorption, Distribution and Excretion of Toxicants; Biotransformation of Xenobiotics</td>
<td>Assignments: Work on Hazard ID of fracking chemicals with Team; mid-term evaluation of participation/contribution</td>
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<td>Thursday, November 15</td>
<td>The internal fate of toxicants: Absorption, Distribution, Excretion, Metabolism</td>
<td>Required: <em>Principles and Practice of Toxicology in Public Health</em>, Chapters 7 – 9</td>
<td>Essentials of Environmental Toxicology, Chapters 4 - 6; Casarett and Doull’s Toxicology. The Basic Science of Poisons, Unit 2: Absorption, Distribution and Excretion of Toxicants; Biotransformation of Xenobiotics</td>
<td>Assignments: Team Assignment Part I, Hazard ID of fracking chemicals is due; Receive and complete Team Assignment Part II: Introduction to computer programs for toxicity prediction</td>
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<tr>
<td>Date</td>
<td>Topic</td>
<td>Reading</td>
<td>Assignments</td>
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| Tuesday, November 20   | The internal fate of toxicants: Absorption, Distribution, Excretion, Metabolism | *Required:* Principles and Practice of Toxicology in Public Health, Chapters 7 – 9  
*Additional:* Essentials of Environmental Toxicology, Chapters 4 - 6; Casarett and Doull’s Toxicology. The Basic Science of Poisons, Unit 2: Absorption, Distribution and Excretion of Toxicants; Biotransformation of Xenobiotics  | Quiz 3  
**Assignments:** Work on poster presentation with Team |
| Thursday, November 22  | Thanksgiving                                                          |                                                                         |                                 |
| Tuesday, November 27   | The internal fate of toxicants: Absorption, Distribution, Excretion, Metabolism | *Required:* Principles and Practice of Toxicology in Public Health, Chapters 7 – 9  
*Additional:* Essentials of Environmental Toxicology, Chapters 4 - 6; Casarett and Doull’s Toxicology. The Basic Science of Poisons, Unit 2: Absorption, Distribution and Excretion of Toxicants; Biotransformation of Xenobiotics  | **Assignments:** Work on poster presentation with Team |
| Thursday, November 29  | The internal fate of toxicants: Absorption, Distribution, Excretion, Metabolism | *Required:* Principles and Practice of Toxicology in Public Health, Chapters 7 – 9  
*Additional:* Essentials of Environmental Toxicology, Chapters 4 - 6; Casarett and Doull’s Toxicology. The Basic Science of Poisons, Unit 2: Absorption, Distribution and Excretion of Toxicants; Biotransformation of Xenobiotics  | **Assignments:** Draft poster due |
| Tuesday, December 4    | Reproductive and Developmental Toxicology                             | **Guest lecturer:** Dr. Catherine Jacobson, Senior Toxicology Specialist, 3M  
**Reading:**  
*Recommended:* In the Womb’s Shadow. The theory of prenatal programming as the fetal origin of various adult diseases is increasingly supported by a wealth of evidence. Silvia Fabiole Nicoletto and Andrea Rinaldi. EMBO reports. 2011. Volume 12. pp. 30-34.  | **Quiz 4** |
Thursday, December 6: *Special topics in toxicology*

**Reading:**
- **Required:** *Principles and Practice of Toxicology in Public Health*, Chapters 10 and 11
- **Additional:** *Essentials of Environmental Toxicology*, Chapter 8; *Casarett and Doull’s Toxicology. The Basic Science of Poisons*, Unit 3: Chemical Carcinogenesis, Genetic Toxicology

**Assignments:** Work on poster presentation with Team

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Tuesday, December 11: *Poster Presentations*

5:45 – 6:35 pm: Teams 1 – 7 present
6:45 – 7:35 pm: Teams 8 – 14 present

**Assignments:** Evaluate poster presentations

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**VII. Evaluation and Grading**

This course includes lectures, a group presentation, a paper, and exams. Grading percentages are based on total performance on exams and assignments. Extra credit projects will not be accepted to improve a grade. The curve may be adjusted depending on the overall performance of the class (see *Grading Criteria* below). Course grades will be determined by the following:

**Team Work**
- Hazard Identification Part I (20%)
- Hazard Identification Part II (5%)
- Poster presentation (20%)

**Individual Work**
- Quizzes (40%)
- Poster presentation evaluation (10%)
- Team participation/contribution (5%)

**Procedure for contesting a grade:**

1. Make a photocopy of the exam question or the assignment, and your answer.
2. Write an explanation that describes why you disagree with the grade.
3. Deliver the items mentioned in 1 and 2 to the instructor’s mailbox within one week of receiving the grade from your exam or assignment.
4. Make an appointment with the instructor to discuss your question.

**Make-up Exams and Assignments**

Students who foresee the need to reschedule an exam or in-class assignment, or who have a doctor’s note indicating they are too sick to attend class are expected to make the appropriate rescheduling arrangements with the instructor. I will consider giving an alternative examination or assignment date or to students with a clear and compelling need for one. While it is possible to make-up individual work, it is not possible to make-up group work. Therefore, in general there will be no make-up option for group work.
Grading Criteria

A/F letter grade will be determined by total effort as follows:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percent Range</th>
<th>Notes</th>
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<tbody>
<tr>
<td>A</td>
<td>92-100%</td>
<td>(4.0) Represents achievement that is outstanding relative to the level necessary to meet course requirements.</td>
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<tr>
<td>A-</td>
<td>88-91.5%</td>
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<tr>
<td>B+</td>
<td>84-87.5%</td>
<td>(3.0) Represents achievement that is significantly above the level necessary to meet course requirements.</td>
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<tr>
<td>B</td>
<td>80-83.5%</td>
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</tr>
<tr>
<td>B-</td>
<td>76-79.5%</td>
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</tr>
<tr>
<td>C+</td>
<td>72-75.5%</td>
<td>(2.0) Represents achievement that meets the minimum course requirements.</td>
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<tr>
<td>C</td>
<td>68-71.5%</td>
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<tr>
<td>C-</td>
<td>64-67.5%</td>
<td></td>
</tr>
<tr>
<td>D+</td>
<td>60-63.5%</td>
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<tr>
<td>D</td>
<td>56-59.6%</td>
<td>(1.0) Achievement below minimum course expectations but sufficient to be awarded credit.</td>
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<tr>
<td>D-</td>
<td>52-55.5</td>
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<tr>
<td>F</td>
<td>&lt;51.5</td>
<td>Represents failure (or no credit) and signifies that the work was either (1) completed but at a level of achievement that is not worthy of credit or (2) was not completed and there was no agreement between the instructor and the student that the student would be awarded an I.</td>
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S/N option must complete all assignments to a C- level (70%):

<table>
<thead>
<tr>
<th>Grade</th>
<th>Notes</th>
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<tr>
<td>S</td>
<td>Achievement that is satisfactory will be expected to complete all assignments and receive a minimum of 70% to receive a passing score (achievement required for an S is at the discretion of the instructor but may be no lower than a 70%).</td>
</tr>
<tr>
<td>F</td>
<td>Represents failure (or no credit) and signifies that the work was either (1) completed but at a level of achievement that is not worthy of credit or (2) was not completed and there was no agreement between the instructor and the student that the student would be awarded an I.</td>
</tr>
</tbody>
</table>

Course Evaluation

SPH collects student course evaluations electronically using a software system called CoursEval: www.sph.umn.edu/courseval. The system will send email notifications to students when they can access and complete their course evaluations. Students who complete their course evaluations promptly will be able to access their final grades just as soon as the faculty member renders the grade in SPHGrades: www.sph.umn.edu/grades. All students will have access to their final grades through OneStop two weeks after the last day of the semester regardless of whether they completed their course evaluation or not. Student feedback on course content and faculty teaching skills are an important means for improving our work. Please take the time to complete a course evaluation for each of the courses for which you are registered.

Incomplete Contracts

A grade of incomplete "I" shall be assigned at the discretion of the instructor when, due to extraordinary circumstances (e.g., documented illness or hospitalization, death in family, etc.), the student was prevented from completing the work of the course on time. The assignment of an "I" requires that a contract be initiated and completed by the student before the last official day of class, and signed by both the student and instructor. If an incomplete is deemed appropriate by the instructor, the student in consultation with the instructor, will specify the time and manner in which the student will complete course requirements. Extension for completion of the work will not exceed one year (or earlier if designated by the student’s college). For more information and to initiate an incomplete contract, students should go to SPHGrades at: www.sph.umn.edu/grades.

University of Minnesota Uniform Grading and Transcript Policy

A link to the policy can be found at onestop.umn.edu.
VIII. Other Course Information and Policies

Grade Option Change (if applicable)
For full-semester courses, students may change their grade option, if applicable, through the second week of the semester. Grade option change deadlines for other terms (i.e. summer and half-semester courses) can be found at onestop.umn.edu.

Course Withdrawal
Students should refer to the Refund and Drop/Add Deadlines for the particular term at onestop.umn.edu for information and deadlines for withdrawing from a course. As a courtesy, students should notify their instructor and, if applicable, advisor of their intent to withdraw.

Students wishing to withdraw from a course after the noted final deadline for a particular term must contact the School of Public Health Student Services Center at sph-ssc@umn.edu for further information.

Student Conduct, Scholastic Dishonesty and Sexual Harassment Policies
Students are responsible for knowing the University of Minnesota, Board of Regents’ policy on Student Conduct and Sexual Harassment found at www.umn.edu/regents/polindex.html.

Students are responsible for maintaining scholastic honesty in their work at all times. Students engaged in scholastic dishonesty will be penalized, and offenses will be reported to the SPH Associate Dean for Academic Affairs who may file a report with the University’s Academic Integrity Officer.

The University’s Student Conduct Code defines scholastic dishonesty as “plagiarizing; cheating on assignments or examinations; engaging in unauthorized collaboration on academic work; taking, acquiring, or using test materials without faculty permission; submitting false or incomplete records of academic achievement; acting alone or in cooperation with another to falsify records or to obtain dishonestly grades, honors, awards, or professional endorsement; or altering, forging, or misusing a University academic record; or fabricating or falsifying of data, research procedures, or data analysis.”

Plagiarism is an important element of this policy. It is defined as the presentation of another's writing or ideas as your own. Serious, intentional plagiarism will result in a grade of "F" or "N" for the entire course. For more information on this policy and for a helpful discussion of preventing plagiarism, please consult University policies and procedures regarding academic integrity: http://writing.umn.edu/tww/plagiarism/.

Students are urged to be careful that they properly attribute and cite others' work in their own writing. For guidelines for correctly citing sources, go to http://tutorial.lib.umn.edu/ and click on “Citing Sources”.

In addition, original work is expected in this course. Unless the instructor has specified otherwise, all assignments, papers, reports, etc. should be the work of the individual student. It is unacceptable to hand in assignments for this course for which you receive credit in another course unless by prior agreement with the instructor. Building on a line of work begun in another course or leading to a thesis, dissertation, or final project is acceptable.

Disability Statement
It is University policy to provide, on a flexible and individualized basis, reasonable accommodations to students who have a documented disability (e.g., physical, learning, psychiatric, vision, hearing, or systemic) that may affect their ability to participate in course activities or to meet course requirements. Students with disabilities are encouraged to contact Disability Services to have a confidential discussion of their individual needs for accommodations. Disability Services is located in Suite180 McNamara Alumni Center, 200 Oak Street. Staff can be reached by calling 612/626-1333 (voice or TTY).

Mental Health Services:
As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student’s ability to participate in daily activities. University of Minnesota services are available to assist you with addressing these and other concerns you may be experiencing. You can learn more about the broad range of confidential mental health services available on campus via www.mentalhealth.umn.edu