I. Course Description

This course examines the environment as a determinant of disease in humans. The primary focus is on identifying the biological mechanisms and effects of chemical, biological, and physical agents on human health. This course emphasizes understanding the principles of toxicology as they apply to understanding toxicant-human interactions.

II. Course Prerequisites

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

III. Course Goals and Objectives

This course will provide students with a basic framework with which to approach the following:

1. The investigation of adverse health effects resulting from exposure to environmental agents
2. The interpretation and evaluation of toxicology studies
3. The investigation of how biochemical, physiological, and environmental factors affect toxicity
IV. Methods of Instruction and Work Expectations

This course includes lectures, a group presentation, exams, and a paper. 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 assignment. 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:

- News of the Week presentation (30%)
- Exams (40%)
- IRIS project (30%)

A. News of the week (30%)
Students will be assigned to a group. Beginning Tuesday, November 3, each class period one group will lead a brief class discussion (15-20 minutes) on a current topic that concerns environmental health, such as an item that has recently appeared in the news or a scientific journal (there will be no group presentations on December 1). The discussion should address the concerns and controversies raised by the issue. The grade will be based on how well the group presents the issue and leads the discussion. For example, each group should consider preparing a set of questions to encourage class discussion. The list of groups will be available on the Web site for this course. Each group should appoint a group leader. The leader is responsible for explaining to the instructor how each group member contributed to the presentation. This can be done by sending an e-mail message to the instructor at watte004@umn.edu.

B. Exams (40%)
Two exams will be given (see Course Outline/Weekly Schedule). Students will take each exam two ways. First, students will first take the test individually. Then students will gather with their group members to take the same test as a group. No books or written notes are allowed while taking the tests. The purpose of taking the exam in groups is to further facilitate learning. An average of the individual and group scores will represent the individual’s score for each test.

Makeup exams will be provided for students who miss exams because of scheduled activities of an official University student organization, a religious holiday, a verifiable illness, a serious family emergency, jury duty or subpoenas. To be eligible for makeup tests, students must furnish documentation that verifies the reason for their absences and notify the instructor ahead of time.

C. IRIS project (30%)
See the following page.
C. IRIS project (30%)
A description of this assignment will be available on the Web site for this course. This assignment can be completed as an individual or a group project (the group can be no larger than 4 people).

Choose a chemical of interest that is listed on the Integrated Risk Information System (IRIS) web site (http://cfpub.epa.gov/ncea/iris/index.cfm?fuseaction=iris.showSubstanceList). Review, summarize, and critique the IRIS file. You need to access the document listed under the column called “IRIS Summary.”

The paper must be written in your own words. Do not cut and paste from the IRIS file. Use your own words to summarize data.

The paper must clearly discuss the following:

1. A brief summary of why you chose this chemical. Explain how people are likely to be exposed to the chemical. Explain why is this a chemical of concern or interest.

2. Basis of one of the following:
   a. Oral RfD (critical effects, other types of toxic effects, basis of uncertainty factors, data gaps).
   b. RfC (critical effects, other types of toxic effects, basis of uncertainty factors, data gaps)
   c. Carcinogenicity assessment (basis of classification, basis of slope factor, data gaps)

3. State whether you agree or disagree with the level of confidence that the EPA states in their assessment. Explain your position. Suggest further studies that you believe are important to reduce uncertainty and address data gaps.

   • The paper must be no longer than 4 double-spaced pages with 1-inch margins, and at least 12-point font. Fewer than 4 pages is acceptable; greater than 4 pages is not acceptable.

   • It is important that you clearly distinguish between the EPA critique and your own critique. Your critique is the most important part of the paper.

   • Report your choice of substance, and whether you are completing the assignment as a group project or individual project, by Tuesday, November 10, 2009.

   • The paper is due by the beginning of class on Tuesday, December 8, 2009.

   • If you turn in your paper after the due date, one point will automatically be deducted for each day after the deadline. For example, if you turn in your paper 3 days after the due date, 3 points will be automatically deducted.

   • No papers will be accepted after Tuesday, December 15, 2009.
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:**
*Principles and Practice of Toxicology in Public Health* by Ira S. Richards. ISBN: 978-0-7637-3823-5

**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: http://www.knovel.com/knovel2/Toc.jsp?BookID=956

**Highly recommended reading:**
*Dark Remedy. The Impact of Thalidomide and its Revival as a Vital Medicine* by Trent Stephens and Rock Bryner. This story is about a major toxicological disaster that occurred in Europe and Canada, and how a brave and wise 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 presents fascinating cases of environmental health issues that have occurred throughout history, including how Bill Bowerman, the cofounder of Nike, was poisoned by the materials he used to develop running shoes.


**Useful Web Sites**

Integrated Risk Information System (USEPA)  
http://www.epa.gov/ncea/iris/

National Center for Environmental Assessment  
http://cfpub.epa.gov/ncea/

National Toxicology Program  
http://ntp-server.niehs.nih.gov/

Agency for Toxic Substances and Disease Registry  
http://www.atsdr.cdc.gov/

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

Multimedia Guide to Cancer Biology  
http://www.insidecancer.org/

National Institutes of Health Office of Laboratory Animal Welfare  
http://grants.nih.gov/grants/olaw/olaw.htm

The Center for Writing, which provides free help with writing assignments  
http://writing.umn.edu/sws/index.htm
VI. Course Outline/Weekly Schedule

Tuesday, October 27: Introduction, The Dose Makes the Poison

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

Thursday, October 29: Fundamentals of Toxicology Studies and their use in Risk Assessment

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

Tuesday, November 3: Fundamentals of Toxicology Studies and their use in Risk Assessment

Reading:
Same as October 29.

News of the week: Group 1

Thursday, November 5: Factors that Affect Toxicity: Absorption, Distribution, Excretion

Reading:
- Required: Principles and Practice of Toxicology in Public Health, Chapters 7 and 8
- Additional: Essentials of Environmental Toxicology, Chapters 4 - 6; Casarett and Doull’s Toxicology. The Basic Science of Poisons, Chapter 5.

News of the week: Group 2

Tuesday, November 10: Factors that Affect Toxicity: Absorption, Distribution, Excretion

Reading:
Same as November 5

News of the week: Group 3
Deadline for notifying instructor about choice of topic for IRIS project.

Thursday, November 12: Factors that Affect Toxicity: Xenobiotic Metabolism

Reading:
- Required: Principles and Practice of Toxicology in Public Health, Chapter 9
- Additional: Essentials of Environmental Toxicology, Chapter 6; Casarett and Doull’s Toxicology. The Basic Science of Poisons, Chapter 6.

News of the week: Group 4

Tuesday, November 17: Exam 1

News of the week: Group 5
Thursday, November 19: *Factors that Affect Toxicity: Xenobiotic Metabolism*

**Reading:** Same as November 12

**News of the week:** Group 6

Tuesday, November 24: *Immunotoxicology*

**Guest Lecturer:** Professor Devavani Chatterjea, Department of Biology, Macalester College

**Reading:**
- Required: *Principles and Practice of Toxicology in Public Health*, Chapter 12
- Additional: *Casarett and Doull’s Toxicology. The Basic Science of Poisons*, Chapter 12

**News of the week:** Group 7

Thursday, November 26: Thanksgiving

Tuesday, December 1: *Reproductive and Developmental Toxicology; National Children’s Health Study*

**Guest Lecturers:** Dr. Catherine Jacobson, 3M Corporate Toxicology and Regulatory Services; Professor Pat McGovern, Division of Environmental Health Sciences

**Reading:**
- Additional: *Essentials of Environmental Toxicology*, Chapter 8; *Casarett and Doull’s Toxicology. The Basic Science of Poisons*, Chapters 20 and 21.

Thursday, December 3: *Special Topics in Xenobiotic Metabolism*

**Guest Lecturer:** Professor Lisa Peterson, Division of Environmental Health Sciences

**Reading:** Same as November 12

**News of the week:** Group 8

Tuesday, December 8: *The Relevance of –Omics Technology to Environmental Health*

**Guest Lecturer:** Kristin Oehlke, Division of Environmental Health Sciences and Minnesota Department of Health

**News of the week:** Group 9

IRIS project due

Thursday, December 10: *Carcinogenesis*

**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*, Chapters 8 and 9

**News of the week:** Group 10

Tuesday, December 15: **Exam 2**

**News of the week:** Group 11
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:

- News of the Week presentation (30%)
- IRIS project (30%)
- Exams (40%)

Procedure for contesting a grade:

If you disagree with the grade for an exam question or assignment, please do the following:
1. Make a photocopy of the exam question and your answer, or the assignment.
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.

Grading Criteria

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

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
<th>Description</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>
</tr>
<tr>
<td>A-</td>
<td>88-91.5%</td>
<td></td>
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<tr>
<td>B+</td>
<td>84-87.5%</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>80-83.5%</td>
<td>(3.0) Represents achievement that is significantly above the level necessary to meet course requirements.</td>
</tr>
<tr>
<td>B-</td>
<td>76-79.5%</td>
<td></td>
</tr>
<tr>
<td>C+</td>
<td>72-75.5%</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>68-71.5%</td>
<td>(2.0) Represents achievement that meets the minimum course requirements.</td>
</tr>
<tr>
<td>C-</td>
<td>64-67.5%</td>
<td></td>
</tr>
<tr>
<td>D+</td>
<td>60-63.5%</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>56-59.6%</td>
<td>(1.0) Achievement below minimum course expectations but sufficient to be awarded credit.</td>
</tr>
<tr>
<td>D-</td>
<td>52-55.5</td>
<td></td>
</tr>
<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>Description</th>
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<tbody>
<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
Beginning in fall 2008 the SPH will collect student course evaluations electronically using a software system called 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. All students will have access to their final grades 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 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 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: 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 Office of Student Academic Integrity (OSAI, www.osai.umn.edu).

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. 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).