School of Public Health
Syllabus and Course Information

UNIVERSITY OF MINNESOTA
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PubH 6112
Environmental Health Risk Assessment: Application to Human Health Risks from Exposure to Chemicals
Spring 2018

Credits:	**2**
Meeting Days:	**Wednesday**
Meeting Time:	**3:30 P.M. - 5:20 P.M.**
Meeting Place:	**Mayo D325**
Instructor:	**Elizabeth Wattenberg, Ph.D.** **Associate Professor, Division of Environmental Health Sciences**
Office Address:	**1110 Mayo**
Office Phone:	**612-626-0184**
E-mail:	**watte004@umn.edu**
Office Hours:	**e-mail to make an appointment**

I. Course Description

This course provides a general survey of risk assessment as it is used in environmental health regulatory decision-making. This course will address the basic components and applications of environmental health risk assessment, including exposure assessment, hazard identification, dose-response evaluation, and risk characterization, and risk management. The major goal of this course is to introduce students to real world applications of environmental health risk assessment, including the associated complexities, challenges, and controversies.

II. Course Prerequisites

Introductory courses in toxicology and exposure analysis (e.g., PubH 6104 Environmental Health Effects: Introduction to Toxicology and PubH 6103 Exposure to Environmental Hazards), the equivalent, or permission from the instructor

III. Course Goals and Objectives

- Learn the basic process and fundamental steps involved in conducting a health risk assessment
- Practice applying risk assessment methods to evaluate the potential of chemicals to harm human health
- Practice writing a health risk assessment document
- Practice presenting environmental health risk assessment information to professionals

IV. Methods of Instruction and Work Expectations

This course includes lectures, in-class activities, and a project and presentation. Experts who practice risk assessment will give several lectures that emphasize real-life applications of environmental health risk assessment. ***Attending class is very important because you will be learning directly from the experts and you will practice applying risk assessment methods.*** Grading percentages are based on total performance on the assignments. Extra credit projects will not be accepted to improve a grade or as a substitute for 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:

Class participation (25 points)

- All students must attend class on Wednesday, May 2 when final presentations will be given for Minnesota Technical Assistant Program (MnTAP) staff. Students must attend all of the presentations.
- Students will receive 25 points for attendance and participation in in-class activities. You can miss up to two classes (except for May 2) without losing any points. If you miss a class, you will be responsible for completing any in-class activities related to the course project on your own. If class notes are not posted, you will be responsible for obtaining notes from another student.

Project (75 points)

You will assist the Minnesota Technical Assistant Program (MnTAP) with a project to reduce emissions of volatile organic compounds (VOCs) into the environment from janitorial supplies, and to reduce health risks to the people who use these products in their occupation. Your specific job is to compare the environmental and occupational human health risks of two janitorial supplies products that are currently being used, and make a recommendation to MnTAP regarding which product is less hazardous to workers and "greener" to the environment.

The bottom line for MnTAP is this: based on your analysis, which janitorial product should be used in order to both protect workers and the environment? MnTAP wants an answer. *They will not accept any conclusion along the lines of "more research is needed."*

MnTAP is particularly concerned with VOCs because they react with sunlight and produce ozone. Ozone at ground level can cause respiratory tract problems, especially in susceptible populations. VOCs can also harm the health of the people who work directly with these chemicals.

The two major goals of the MnTAP project are to help identify products for businesses that will do the following:

1. Reduce the emissions of VOCs into the environment, and thus reduce health risks of the general population from exposure to ozone through air pollution.
2. Reduce health risks to the workers by reducing their exposure to hazardous chemicals in the workplace.

Deliverables: Please note that specific detailed instructions for each deliverable will be given in class and posted on the Moodle site; some deliverables will be developed as part of in-class exercises.

1. **Summary of your analysis and your recommendation (50 points).**
   This document will include the following:
   a. Your recommendation regarding which of the products the business should use, a justification for your recommendation, and a discussion of uncertainties and assumptions.
   b. A table that compares information on VOC content, ozone-producing potential, and general safety information for the two products.
   c. A table that compares the health hazards of the two products.
   d. A document that lists exposure limits for each component of the product.
   e. A description and summary of your exposure analysis.
   f. An annotated bibliography that summarizes health hazard and dose response information and lists the sources of this information.
2. **A presentation to MnTAP staff on your analysis and recommendation (25 points)**.

V. Course Text and Readings

Readings from government reports, research papers, or websites may be listed under each lecture, along with information on how to access them.

Additional Resources:
Risk Assessment for Environmental Health. Robson, M. G. and Toscano, W. A. Eds.; Josey-Bass: San Francisco, 2007. One copy is available on reserve at the Biomedical Library.

Risk Assessment in the Federal Government: Managing the Process. National Research Council; National Academy Press, Washington, D.C., 1983. Available free online at: http://www.nap.edu/openbook.php?isbn=0309033497.

Science and Decisions: Advancing Risk Assessment. National Research Council; National Academy Press, Washington, D.C., 2009. Available free online at: http://www.nap.edu/catalog.php?record_id=12209.

VOC exempt list
http://www.cdpr.ca.gov/docs/emon/vocs/vocproj/2voc_exempt_list.pdf

Criteria for VOC-exempt solvents
http://www.epa.gov/sites/production/files/2014-02/documents/dfe_criteria_voc_exempt_solvents.pdf

Updated Maximum Incremental Reactivity Scale and Hydrocarbon Bin Reactivities for Regulatory Applications. W.P.L. Carter. California Air Resources Board. 2010.
http://www.arb.ca.gov/regact/2009/mir2009/mir10.pdf

Workers Become Ill from Floor Strippers
https://www.ahcmedia.com/articles/121293-workers-become-ill-from-floor-strippers

Good review of basic principles in toxicology
Toxicology Tutor I, National Library of Medicine
http://sis.nlm.nih.gov/enviro/toxtutor/Tox1/amenu.htm

Toxicology Tutor II, National Library of Medicine
http://sis.nlm.nih.gov/enviro/toxtutor/Tox2/amenu.htm

VI. Course Outline/Weekly Schedule

Wednesday January 17: *Introduction to Environmental Health Risk Assessment*
Guest lecturer: Michelle Gage, Minnesota Technical Assistance Program (MnTAP)

Reading: Review the slides shown on the website below under the section Toxicology Tutor I: Risk Assessment for a good, general overview of environmental health risk assessment. Taking the quizzes included in this module is highly recommended. You may want to review different sections of this slide set when specific topics are discussed in class. http://sis.nlm.nih.gov/enviro/toxtutor/Tox1/amenu.htm

Workers Become Ill from Floor Strippers
https://www.ahcmedia.com/articles/121293-workers-become-ill-from-floor-strippers

Assignments: Introduction to Risk Assessment Project

Wednesday January 24: *Hazard Identification: Determination of what types of toxicity chemicals can cause; Application of Read Across and Computational Toxicology in Hazard Identification*
Guest lecturers: Catherine F. Jacobson, 3M, Robert Roy, 3M, and Colin Owens, 3M

Reading:
Review the slides shown on the website below under the section *Toxicology Tutor I: Risk Assessment* that describe *Hazard Identification*. http://sis.nlm.nih.gov/enviro/toxtutor/Tox1/amenu.htm

A systematic approach for evaluating the quality of experimental toxicological and ecotoxicological data. HJ Klimisch et al., Regul Toxicol Pharmacol 25:1-5, 1997. Available online through the Bio-Med Library.

Recognition of Adverse and Nonadverse Effects in Toxicity Studies. RW Lewis *et al. Toxicologic Pathology* 30:66-74, 2002. Available online through the Bio-Med Library.

Watch the Video: Hazard vs. Risk – Same Difference? https://www.youtube.com/watch?v=VF-8QksiU7c

Wednesday January 31: *Hazard Identification continued; application of traditional in vivo toxicology studies in Hazard Identification*
Guest lecturers: Catherine F. Jacobson, 3M, Robert Roy, 3M

Wednesday, February 7: *Application of Hazard Identification for course project*

Reading:
Review the slides shown on the website below under the section *Toxicology Tutor I: Risk Assessment* that describe *Hazard Identification*. http://sis.nlm.nih.gov/enviro/toxtutor/Tox1/amenu.htm

A systematic approach for evaluating the quality of experimental toxicological and ecotoxicological data. HJ Klimisch et al., Regul Toxicol Pharmacol 25:1-5, 1997. Available online through the Bio-Med Library.

Recognition of Adverse and Nonadverse Effects in Toxicity Studies. RW Lewis *et al. Toxicologic Pathology* 30:66-74, 2002. Available online through the Bio-Med Library.

Watch the Video: Hazard vs. Risk – Same Difference? https://www.youtube.com/watch?v=VF-8QksiU7c

Work in class: Begin hazard identification for project, bring a lap top to class

Assignments: Receive assigned products for your report, meet your team

Wednesday, February 14: *Basic Characterization of Products for course project*

Work in class: Find and compare information on VOC content, ozone-producing potential, and general safety of the products assigned to your group.

Assignments: Receive instructions for your presentation.

Wednesday, February 21*:* Dose Response

Reading:
Review the slides shown on the website below under the section Toxicology Tutor I: Risk Assessment that describe Dose-Response Assessment and Risk Characterization.
http://sis.nlm.nih.gov/enviro/toxtutor/Tox1/amenu.htm

Quantitative risk assessment methods for cancer and noncancer effects. Baynes RE. Prog Mol Biol Transl Sci 112: 259-283. (2012). Available online through the Bio-Med Library

For discussions of significant/acceptable cancer risk levels see the following:
Significant risk decisions in federal regulatory agencies. Rodricks JV et al. Regulatory Toxicology and Pharmacology. 7:307-320 (1987). Available online through the Bio-Med Library

Water quality: Guidelines, standards and health. Edited by Lorna Fewtrell and Jamie Bartram
Published on behalf of WHO by IWA Publishing (2001). See chapter 10 on Acceptable Risk.
http://www.who.int/water_sanitation_health/dwq/whoiwa/en/

Video: What does “Probably Cause Cancer” actually mean?
https://www.youtube.com/watch?v=CbBkB81ySxQ

Work in class: Identify exposure limits for each component of the products.

Wednesday, February 28: *Exposure Evaluation*
Guest lecturer: Professor Susan Arnold, Division of Environmental Health Sciences

Reading:
Review the slides shown on the website below under the section Toxicology Tutor I: Risk Assessment that describe Exposure Assessment. http://sis.nlm.nih.gov/enviro/toxtutor/Tox1/amenu.htm

Work in class: Estimate exposure to products

Wednesday, March 7: *Toxic Substances Control Act (TSCA) Reform*
Guest lecturer: Jon Gerber, 3M

Wednesday, March 14: *Spring break*

Wednesday, March 21: *Green Chemistry*
Guest lecturer: Cher Sanchez, 3M

Wednesday, March 28: *Risk Management in Public Health: The intersection of Competing Interests*
Guest lecturers: Allen Broderius and Nathan Pechacek, Ecolab

Assignments: Draft of complete risk assessment document due to the instructor by the beginning of class.

Wednesday, April 4: *Workshop draft risk assessment document*

Wednesday, April 11 *Exposure Evaluation and Biomonitoring*
Guest lecturers: Jessica Nelson and Chris Greene, Minnesota Department of Health

Reading:
Review the slides shown on the website below under the section Toxicology Tutor I: Risk Assessment that describe Exposure Assessment. http://sis.nlm.nih.gov/enviro/toxtutor/Tox1/amenu.htm

Wednesday, April 18: *The Components of a Cumulative Risk, Cumulative Impacts and Cumulative Effects Assessment.*
Guest lecturer: Kristie Ellickson, Minnesota Pollution Control Agency

Reading: EPA document "Guidance on Cumulative Risk Assessment of Pesticide Chemicals That have a Common Mechanism of Toxicity". Read through Figure 1 on page 11. Then, read pages 30-42. This document is online at this URL: https://www.epa.gov/sites/production/files/2015-07/documents/guidance_on_common_mechanism.pdf

Cumulative Risk: Toxicity and Interactions of Physical and Chemical Stressors. C.V. Rider et al. Toxicological Sciences, 137:39-11, 2014. Available online through the Bio-Med Library.

Cumulative Risk Assessment Toolbox: Methods and Approaches for the Practioner. M.M. MacDonell et al. Journal of Toxicology. Volume 2013 (2013), Article ID 310904, 36 pages. Available online through the Bio-Med Library.

Assignments: Draft presentation due by the beginning of class

Wednesday, April 25: *Workshop draft presentations*

Wednesday, May 2: Final presentations for MNTAP staff

Assignments: Electronic copies of project due by the beginning of class

VII. Evaluation and Grading

- **Class participation (20 points)**
- **Project (80 points)**

A 4.000 - Represents achievement that is outstanding relative to the level necessary to meet course requirements

A- 3.667

B+ 3.333

B 3.000 - Represents achievement that is significantly above the level necessary to meet course requirements

B- 2.667

C+ 2.333

C 2.000 - Represents achievement that meets the course requirements in every respect

C- 1.667

D+ 1.333

D 1.000 - Represents achievement that is worthy of credit even though it fails to meet fully the course requirements

S Represents achievement that is satisfactory, which is equivalent to a C- or better.

For additional information, please refer to:
http://policy.umn.edu/Policies/Education/Education/GRADINGTRANSCRIPTS.html.

Course Evaluation
The SPH will collect 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 Office of Admissions and Student Resources at sph-ssc@umn.edu for further information.

Student Conduct Code

The University seeks an environment that promotes academic achievement and integrity, that is protective of free inquiry, and that serves the educational mission of the University. Similarly, the University seeks a community that is free from violence, threats, and intimidation; that is respectful of the rights, opportunities, and welfare of students, faculty, staff, and guests of the University; and that does not threaten the physical or mental health or safety of members of the University community.

As a student at the University you are expected adhere to Board of Regents Policy: *Student Conduct Code*. To review the Student Conduct Code, please see: http://regents.umn.edu/sites/default/files/policies/Student_Conduct_Code.pdf.

Note that the conduct code specifically addresses disruptive classroom conduct, which means "engaging in behavior that substantially or repeatedly interrupts either the instructor's ability to teach or student learning. The classroom extends to any setting where a student is engaged in work toward academic credit or satisfaction of program-based requirements or related activities."

Use of Personal Electronic Devices in the Classroom

Using personal electronic devices in the classroom setting can hinder instruction and learning, not only for the student using the device but also for other students in the class. To this end, the University establishes the right of each faculty member to determine if and how personal electronic devices are allowed to be used in the classroom. For complete information, please reference: http://policy.umn.edu/Policies/Education/Education/STUDENTRESP.html.

Scholastic Dishonesty

You are expected to do your own academic work and cite sources as necessary. Failing to do so is scholastic dishonesty. Scholastic dishonesty means 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; altering, forging, or misusing a University academic record; or fabricating or falsifying data, research procedures, or data analysis. (Student Conduct Code: http://regents.umn.edu/sites/default/files/policies/Student_Conduct_Code.pdf) If it is determined that a student has cheated, he or she may be given an "F" or an "N" for the course, and may face additional sanctions from the University. For additional information, please see: http://policy.umn.edu/Policies/Education/Education/INSTRUCTORRESP.html.

The Office for Student Conduct and Academic Integrity has compiled a useful list of Frequently Asked Questions pertaining to scholastic dishonesty: http://www1.umn.edu/oscai/integrity/student/index.html. If you have additional questions, please clarify with your instructor for the course. Your instructor can respond to your specific questions regarding what would constitute scholastic dishonesty in the context of a particular class-e.g., whether collaboration on assignments is permitted, requirements and methods for citing sources, if electronic aids are permitted or prohibited during an exam.

Makeup Work for Legitimate Absences
Students will not be penalized for absence during the semester due to unavoidable or legitimate circumstances. Such circumstances include verified illness, participation in intercollegiate athletic events, subpoenas, jury duty, military service, bereavement, and religious observances. Such circumstances do not include voting in local, state, or national elections. For complete information, please see: http://policy.umn.edu/Policies/Education/Education/MAKEUPWORK.html.

Appropriate Student Use of Class Notes and Course Materials
Taking notes is a means of recording information but more importantly of personally absorbing and integrating the educational experience. However, broadly disseminating class notes beyond the classroom community or accepting compensation for taking and distributing classroom notes undermines instructor interests in their intellectual work product while not substantially furthering instructor and student interests in effective learning. Such actions violate shared norms and standards of the academic community. For additional information, please see: http://policy.umn.edu/Policies/Education/Education/STUDENTRESP.html.

Sexual Harassment
"Sexual harassment" means unwelcome sexual advances, requests for sexual favors, and/or other verbal or physical conduct of a sexual nature. Such conduct has the purpose or effect of unreasonably interfering with an individual's work or academic performance or creating an intimidating, hostile, or offensive working or academic environment in any University activity or program. Such behavior is not acceptable in the University setting. For additional information, please consult Board of Regents Policy: http://regents.umn.edu/sites/default/files/policies/SexHarassment.pdf

Equity, Diversity, Equal Opportunity, and Affirmative Action
The University will provide equal access to and opportunity in its programs and facilities, without regard to race, color, creed, religion, national origin, gender, age, marital status, disability, public assistance status, veteran status, sexual orientation, gender identity, or gender expression. For more information, please consult Board of Regents Policy: http://regents.umn.edu/sites/default/files/policies/Equity_Diversity_EO_AA.pdf.

Disability Accommodations
The University of Minnesota is committed to providing equitable access to learning opportunities for all students. Disability Services (DS) is the campus office that collaborates with students who have disabilities to provide and/or arrange reasonable accommodations.

If you have, or think you may have, a disability (e.g., mental health, attentional, learning, chronic health, sensory, or physical), please contact DS at 612-626-1333 to arrange a confidential discussion regarding equitable access and reasonable accommodations.

If you are registered with DS and have a current letter requesting reasonable accommodations, please contact your instructor as early in the semester as possible to discuss how the accommodations will be applied in the course.

For more information, please see the DS website, https://diversity.umn.edu/disability/.

Mental Health and Stress Management
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 and may reduce your ability to participate in daily activities. University of Minnesota services are available to assist you. You can learn more about the broad range of confidential mental health services available on campus via the Student Mental Health Website: http://www.mentalhealth.umn.edu.

The Office of Student Affairs at the University of Minnesota

The Office for Student Affairs provides services, programs, and facilities that advance student success, inspire students to make life-long positive contributions to society, promote an inclusive environment, and enrich the University of Minnesota community.

Units within the Office for Student Affairs include, the Aurora Center for Advocacy & Education, Boynton

Health Service, Central Career Initiatives (CCE, CDes, CFANS), Leadership Education and Development –Undergraduate Programs (LEAD-UP), the Office for Fraternity and Sorority Life, the Office for Student Conduct and Academic Integrity, the Office for Student Engagement, the Parent Program, Recreational Sports, Student and Community Relations, the Student Conflict Resolution Center, the Student Parent HELP Center, Student Unions & Activities, University Counseling & Consulting Services, and University Student Legal Service.

For more information, please see the Office of Student Affairs at http://www.osa.umn.edu/index.html.

Academic Freedom and Responsibility: for courses that do not involve students in research

Academic freedom is a cornerstone of the University. Within the scope and content of the course as defined by the instructor, it includes the freedom to discuss relevant matters in the classroom. Along with this freedom comes responsibility. Students are encouraged to develop the capacity for critical judgment and to engage in a sustained and independent search for truth. Students are free to take reasoned exception to the views offered in any course of study and to reserve judgment about matters of opinion, but they are responsible for learning the content of any course of study for which they are enrolled.*

Reports of concerns about academic freedom are taken seriously, and there are individuals and offices available for help. Contact the instructor, the Department Chair, your adviser, the associate dean of the college, or the Vice Provost for Faculty and Academic Affairs in the Office of the Provost.

OR:

Academic Freedom and Responsibility, for courses that involve students in research

Academic freedom is a cornerstone of the University. Within the scope and content of the course as defined by the instructor, it includes the freedom to discuss relevant matters in the classroom and conduct relevant research. Along with this freedom comes responsibility. Students are encouraged to develop the capacity for critical judgment and to engage in a sustained and independent search for truth. Students are free to take reasoned exception to the views offered in any course of study and to reserve judgment about matters of opinion, but they are responsible for learning the content of any course of study for which they are enrolled.* When conducting research, pertinent institutional approvals must be obtained and the research must be consistent with University policies.

Reports of concerns about academic freedom are taken seriously, and there are individuals and offices available for help. Contact the instructor, the Department Chair, your adviser, the associate dean of the college, or the Vice Provost for Faculty and Academic Affairs in the Office of the Provost.

* Language adapted from the American Association of University Professors "Joint Statement on Rights and Freedoms of Students".

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