Washington State University

MAJOR CURRICULAR CHANGE FORM -- COURSE REVISION

☐ Please attach rationale for your request, a complete syllabus, and explain how this impacts other units in Pullman and other campuses (if applicable).
☐ Obtain all required signatures with dates.
☐ Provide original stapled packet of signed form/rationale statement/syllabus PLUS 10 stapled copies of complete packet to the Registrar's Office, campus mail code 1035.
☐ Submit one electronic copy of complete packet to wsu.curriculum@wsu.edu.

Requested Future Effective Date: August 24, 2015 (term/year) Course Typically Offered: Spring & Online

DEADLINES: For full term effective date: October 1st; for spring or summer term effective date: March 1st. See instructions.

NOTE: Items received after deadlines may be put to the back of the line or forwarded to the following year. Please submit on time.

Current course [List course as it currently appears in the catalog]:

IPM 452/552 Pesticides and the Environment

course subject/crosslist
course no.
title

Credit hrs lecture hrs per week lab or studio hrs per week
2 (- -)

prerequisite

Requested Change(s): Check all that apply and list proposed change.

☐ Change subject:____________________________________

☐ Change course number:____________________________________

☐ Change credit to: 3

☐ Change lecture-lab ratio to: (3-0)

☐ Variable credit:____________________________________

☐ Repeat credit (cum. max. hrs):________________________

☐ New/change crosslisting*:____________________________________

☐ Conjoint listing (400/500):

Special Grading: ☐ S, F; ☐ A, S, F (PEACT only); ☐ S, M, F (VET MED only); ☐ H, S, F (PHARMACY, PHARDSCI only)

☐ Other (please list request):____________________________________

NOTE: If only requesting a change to title, prerequisite, and/or description, please use a Minor Curriculum Change form.

☐ Title change:____________________________________

☐ Prerequisite change:____________________________________

☐ Change catalog description to:____________________________________

The following items require prior submission to other committees/depts. (SEE INSTRUCTIONS.)

☐ Request to meet Writing in the Major [M] requirement (Must have All-University Writing Committee Approval.)

☐ Request to meet UCORE in____________________________________ (Must have UCORE Committee Approval >> See instructions.)

☐ Special Course Fee____________________________________ (Must submit request to University Receivables)

Contact: Allan Felsot Phone number: (509) 372-7365 Campus mail code: WSU-TC
Email: afelsot@wsu.edu Instructor, if different:

Chair/date Dean/date All-University Writing Com Date

Chair (if crosslisted/interdisciplinary)* Dean (if crosslisted/interdisciplinary)* UCORE Committee Approval Date

Catalog Subcommittee Approval Date GSC or AAC Approval Date Faculty Senate Approval Date

*If the proposed change impacts or involves collaboration with other units, use the additional signature lines provided for each impacted unit and college.
Rationale for Changing IPM 452/552 from 2 credits to 3 credits

IPM 452/552, Pesticides and the Environment, has been in the WSU catalog since Spring 2001 and has been offered yearly since then. The course had been originated by Associate Professor Gary Piper who retired at the end of Spring 2013. During Spring 2014, I assumed responsibility for the course, and this semester (Fall 2014) I started teaching the course online, also. Prior to teaching the course for the first time, I had reviewed Dr. Piper’s course syllabus both for the face-to-face course and for the online course. My review of Piper’s course was informed by my research focus in environmental toxicology that I have studied and communicated about during my 36+ years as a faculty member and for over 21 years as an active participant in the WSU Pesticide Education and Safety Program (PESP) that offers throughout the winter months professional pesticide applicator training and recertification workshops.

From my course review, I concluded that the text, syllabus, and subject matter was wholly inadequate, incomplete, and outdated. For example, the text book required for the course was last updated in 2000, yet whole new classes of pesticides and modes of action have been commercialized and are replacing compounds mostly covered in the outdated book. A glaring omission in the lecture schedule was any discussion of biotechnological means of pest control using genetically engineered crops. Yet this modern technology is regulated by EPA as a pesticide, is deployed on at least tens of millions of acres, and has been attended by controversy that rivals the historical concerns over the use of DDT. The course did not cover a whole new group of insecticides deemed very safe for vertebrates but arguably hazardous to bees, yet no specific lectures were devoted to the latest scientific information about this issue. Similarly, effects of certain herbicides on amphibians has become a highly important issue during the last decade, yet the topic was missing from the lecture schedule. In short, the course not only required a complete redevelopment, it required more time to cover modern issues in a critical manner befitting our educational goals.

Thus, to provide students with the basic principles for understanding pesticide behavior in organisms and the environment, “state-of-the-art” information, and a more modern view of pesticide issues, I essentially recreated the whole course that in reflection should be worth three credits, not two. I’ve added five writing assignments in addition to exams. I’ve added extra assignments for the graduate students. The assignments require research of issues by the student and call for them to make a conclusion regarding the assignment prompt (see appended list of Challenge Assignments). The amount of material I cover has significantly expanded but is necessary for training students about the modern technologies. Given the controversy that pesticides generate in modern society, the depth of material had to be expanded. By expanding the course to three credits, I can not only cover essential issues that students should know about, but I can also allow more time for student in-class discussions that would follow from requiring short oral presentations on topical issues.

The appended syllabus (based on a Spring 2015 calendar) has been expanded from my syllabus in Spring 2014 and justifies making this course worth three credits rather than only two. With the extension of more in-class time of a three credit course, I would also include a second oral presentation by the graduate students. Pertinently, similar requirements and subject matter occurs in the online version of the course but a discussion board will be used for exchanging ideas about assigned news stories. In addition to the new syllabus associated with my current instruction of the course, I have appended the 2013 syllabus used by former instructor Piper.

IPM 452 is a required course for several Agricultural & Food System (AFS) and Integrated Plant Sciences (IPS) majors in CAHNRS. Changing the course to three credits only lengthens the typical Tuesday/Thursday lecture schedule by 25 minutes and should have
minimal disruption of student's scheduling. Expanding the number of credits will benefit the students and more accurately reflect the amount of required work.
Pesticides and the Environment (3 credits)
Course Objectives & Syllabus

Instructor: Allan Felsot

Affiliation: Professor, Department of Entomology, CAHNRS
Affiliate Professor, School of the Environment, School of Biological Sciences

Contact Information:
Email: afelsot@wsu.edu
Office Phone: 509-372-7365; iPhone: 509-460-6082
Office Location: WSU TriCities campus, Rm 128E, Food & Environmental Quality Lab; 2710 University Drive, Richland, WA 99354
Office Hours: By appointment

Graduate Teaching Assistant(s):
TBD

Class Schedule & Location:
Lecture: Tues./Thurs., 10:35 – 11:50 h;
Pullman: FSHN 354;
Tri-Cities: West Bldg. 256W

Note: Lecture classes will be taught over AMS. For the majority of the semester, instructor will alternate origination of lectures between the Pullman (Tuesday) and TC (Thursday) campuses. Thus, the instructor will be present in Pullman for the Tuesday lecture and in the TC for the Thursday lecture.

Textbook and Class Notes:
No textbook is required for this course. The subject of ‘Pesticides and the Environment’ is part of the broader area of applied biology known as environmental toxicology that covers both toxicology and environmental chemistry. The core principles for understanding toxicology of any chemical technology and how chemicals behave in the environment are well known. However, the subject matter regarding specific pesticide products is dynamic—new studies are published by the 100’s each month and EPA makes new registration eligibility decisions and issues guidance documents frequently. Any text would soon be out of date. Furthermore, behavior of pesticides in the environment and potential for health or ecological effects must be understood using core principles of physical chemistry and physiologically based pharmacokinetics and pharmacodynamics, which are often lacking in modern college textbooks about the safety of pesticides.

In lieu of a textbook, students will have access to all lecture notes and selected journal papers that will be posted to the course space in Blackboard. Note that the Pullman and TC sections have been merged under the course title. Within the main
folder “Lectures” you’ll find subfolders for each individual lecture, and the lecture notes and associated reading materials will be contained within these subfolders. The syllabus can be downloaded from the the course home page. The student will also find a folder for the various evaluation assignments, including a folder titled **Exams, Challenge Assignments, News Analysis & Validation Report, and Graduate Student Topical News Summary, and Graduate Student Risk Assessment Presentation**. On-line exams will be accessed through the Exam folder, and the other two folders will be used to access rubric information for the writing assignments and drop boxes for uploading the completed assignment.

Blackboard will also be used to issue global class announcements. Blackboard should also be used to email me or the teaching assistant(s) directly. Finally Blackboard will be used by students to post news articles about pesticides and comments on their significance or validity.

**Course Overview**

Pesticides--boon or bane? Nearly 52 years have passed since the publication of Rachel Carson's *Silent Spring* (1962), which warned of dire human health and ecological consequences from indiscriminate use of pesticides, especially DDT. The book galvanized a reappraisal of pesticide technology that was partly responsible for the creation of the Environmental Protection Agency (born in 1970) and amendment of the laws regulating pesticides (i.e., FIFRA, the Federal Fungicide Rodenticide Insecticide Act). But the controversy over pesticide use continues today, despite tremendous changes in pesticide chemistry.

Pesticides prior to WWII were mainly inorganic compounds containing lead and arsenic that left very persistent residues in the soil as well as on fruit. However, a few botanical insecticides were used, including nicotine from tobacco preparations. The remarkably potent insecticidal properties of DDT, a synthetic organic compound containing chlorine, were discovered in the late 1930’s. During WWII DDT was strictly used as a public health protection insecticide and was especially effective in controlling louse borne epidemic typhus and mosquitoes vectoring malaria. DDT’s low acute mammalian dermal toxicity made it easy for workers to handle and dampened concerns about public exposure.

After the end of WWII DDT was quickly and ubiquitously adopted for agricultural, silvicultural, and household uses. DDT’s advantages of prolonged environmental persistence in conjunction with its high broad spectrum insecticidal potency were also its disadvantages for agriculture. DDT degraded very slowly, left residues on crops, was stored in fat, and thus bioaccumulated through the food web. Environmental chemistry & toxicology were barely in their infancy at the time DDT was widely used, but scientists quickly learned that the agriculturally desirable properties of DDT and other chlorinated hydrocarbon insecticides were not necessarily coincident with ecological health.

WWII also marked the birth of a new herbicide that was different than anything before. Scientists discovered the remarkable toxicity of 2,4-D on broadleaf plants but incredible insensitivity of grasses. Pertinently the compound mimicked the plants own hormone auxin (3-indole acetic acid), so there was no reason to think animals would be
at risk for toxicity because they lacked this hormone and associated biochemical pathways. Furthermore, at the time of 2,4-D's discovery, few herbicides were available for weed control except "scorched-earth" substances that would kill by mechanisms common to animals as well as plants. The synthesis of 2,4-D led to the synthesis of analogously potent herbicides that were selective by virtue of their mode of action on plant-specific biochemical targets.

By the 1950's, biodegradable, non-bioaccumulating organophosphorus insecticides had come into commercial use; however, these compounds were extremely acutely toxic and presented a worker safety problem. Many were broad spectrum like DDT, so pest control problems observed with DDT including pest resurgence, enhanced populations of secondary pests, and development of insecticide resistance still bugged growers.

Eventually DDT was globally banned (except for the continued use in highly endemic malaria regions). Along the way, feelings of invincibility moderated and we entered the modern era of environmental concern, myriads of regulations, and an explosion of biological knowledge at the most reductionist molecular scale. We know that pesticide toxicity and environmental behavior are determined by molecular structure, and effect is related to the magnitude of exposure. EPA, the controlling regulatory agency for pesticide technology, conducts ever increasingly detailed risk assessments to ensure pesticides meet the legislatively mandated standard of "reasonable certainty of no harm". Amidst the concern, the technology was significantly changing as ingenuity for chemical synthesis created compounds that can rightly be considered "environmentally friendly" or "reduced risk".

Thus, the marketplace has come a long way in pushing out the old chemistry and supplanting it with more selective and less toxic compounds. Yet, the new chemistry is perhaps even more potent for killing pests as evidenced by a steady decrease in amounts needed to control pests. So, what are the characteristics and behaviors of pesticides that make them less risky or safer for nontarget organisms yet just as lethal to the pests? What chemical properties are most desirable? These are questions related to the environmental aspects of pesticides and other agricultural chemicals and this course will at least partly answer these questions by first focusing on how chemical properties determine environmental behavior and modify toxicity. Because exposure is determined by distribution of chemicals in the environment, factors causing the transport of chemicals in the environment and the magnitude of fluxes between air, water, soil, and biota will be examined. Specific controversies regarding pesticide residues in food, water, and air will be examined and myths and misconceptions about agricultural chemicals will be exposed. Current events as depicted in media headlines will become the impetus for discussions of pesticide effects on endangered salmon, frogs, and bees (pollinators).

This course will contribute to a more complete understanding of pesticide technology and its influence on environmental regulations and controversies since the end of WWII. The course will make extensive use of scholarly literature to illustrate principles of pesticide toxicology and its interface with human and environmental health. Perhaps most importantly, the course will help students cut through the media hype and myths about pesticide technology while offering a practical and reasoned perspective on a very useful technology.
Course Objectives IPM 452/552 (All Students):
1. Review the laws that regulate pesticide technology in the U.S.
2. Explain the practical aspects of pesticide technology including pesticide formulations, role of adjuvants, and the importance of the product label.
3. Explain how EPA uses human and ecological risk assessment to make a decision to register a pesticide product.
4. Use a case study to show how EPA reviews the benefits of a new pesticide.
5. Review legacy conventional pesticides and contrast their physicochemical properties, environmental behavior, and toxicological profiles with modern reduced risk pesticides.
6. Review biopesticides that are regulated as plant incorporated protectants and give an overview of how they differ from synthetic organic pesticides.
7. Analyze the current concerns over effects of pesticides on chronic mammalian toxicity, including effects on endocrine system physiology and on carcinogenic potential.
8. Review exposure potential of humans or other non-target organisms to pesticide residues and place exposure in the context of risk of adverse effects.
9. Analyze the current concerns over effects of pesticides on nontarget organisms using a case studies involving endangered salmon species, frogs, and bees.

Student Learning Objectives IPM 452/552 (All Students):
1. Students will explain the functions of FIFRA, FFDCA, FEPCA, and FQPA.
2. Students will discuss the benefits of the major pesticide classes in protecting crop yield and public health.
3. Students will define and differentiate from a regulatory perspective the terms pest, pesticide, active ingredient, inert or other ingredients, formulation, biopesticide.
4. Students will read and find information on a pesticide product label that is consistent with using the pesticide in a manner that does not violate Federal law.
5. Students will describe the function of formulation ingredients and utility of adjuvants to the efficacy of pest control.
6. Students will explain the physical chemistry principles that drive chemodynamic behavior of pesticides in the environment.
7. Students will differentiate the meanings of and information conveyed by the terms toxicity, hazard, and risk and be able to identify which concept is the objective of published experiments.
8. Students will interpret a dose-response curve and derive benchmarks of toxicity from the function describing the curve.
9. Students will name the main classes of pesticides and be able to describe their function and the biochemical basis of their toxicity.
10. Students will explain the concept of selectivity and provide examples that illustrate it and explain how selectivity is manifested by the interaction of toxicokinetic and toxicodynamic processes.
11. Students will describe hazards of pesticides to human health and interpret these in the context of risk.
12. Students will describe present controversies regarding effects of pesticides on salmon, frogs, and bees and be able to find scholarly journal articles of published research that addresses elements of the controversy.

13. Students will read, interpret, and summarize scholarly journal articles about pesticides.

14. Students will find scholarly journal literature to either support or refute media stories about pesticide issues.

Graduate Student Learning Objectives (IPM 552; in addition to the those for all students);

15. In addition to the global learning objectives, graduate students will analyze a contemporary news story about pesticides and human health and discuss with the class the validity of this story and whether the information is supported by scholarly literature.

16. Graduate students will develop a risk assessment of a pesticide, focusing on potential ecological effects. The risk assessment will be presented as a 15 minute seminar to the class.

Evaluation of All Students (IPM 452 & IPM 552)

Exams (n = 2):

Two on-line exams will be given on Feb 24, 2015 and May 5, 2015. Each will constitute 20% of the final grade (i.e., both exams constitute 40% of the final grade). The exams will be located under the Lesson tab in a folder labeled 'Exams'. The exams are open-book but students must not consult with any other student about the answers. Exams will be composed of approximately 25-30 multiple choice, multiple select, listing, ranking, and/or true-false questions. Exams will open by 8 am on the days designated above and must be completed by 11 pm of the following day.

Challenge Assignments (CA): (n = 5)

All students will turn in five 'Challenge Assignments' to the designated drop box for these assignments under the Lessons tab. For undergrad students, the aggregate total of the CAs will be 40% of the final grade (thus each individual CA is worth 8%). For graduate students, each CA is worth 4% (thus, 20% total). For each of the required CAs, the assignment will be described in the dropbox as well as in a separate WORD file. Students can work in the WORD file, save the information, and then copy the information to the drop box. For several of the CAs, students will need to load a PDF copy of the research papers they are analyzing to the drop box. The CAs are due by 11 pm on the following dates: (1) 20 Jan; (2) 10 Feb; (3) 10 Mar; (4) 2 Apr; (5) 23 Apr.

News Analysis & Validation Report (n = 1):

All students will prepare an analysis of whether a report in the media is validated by the actual research article related to it or on which the report is based. A rubric of expectations and report format will be accessible for guidance in preparing the report. The student will locate a media report of their choice from a menu of possible topics. For purposes of this assignment, a media report includes an on-line newspaper or magazine article, a blog post, or a YouTube video report. After properly listing the
citation for the media report, the student will summarize in one paragraph (300 words or less) the theme of the report. Afterward, the student will deconstruct and analyze for validity the information in the report using the scholarly journal literature. The best place to start searching for either the journal article that is the subject of the report, or a scholarly article that covers the theme of the report, is to use GOOGLE Scholar or Advanced GOOGLE Scholar (http://scholar.google.com). This assignment is worth 20% of the final grade.

Written Summary of Graduate Student Oral Presentations (Extra Credit): Undergraduate students only can earn up to five extra point credits on their Exam 2 score by turning in a 200 word summary of the issues discussed in the graduate student “News Summary Oral Presentation” that is described below.

Additional Assignments for Graduate Students (IPM 552):

News Summary Oral Presentation & Discussion: Graduate students will make a 10 minute presentation that summarizes a news article related to topics covered in the class. The topic to be covered will be assigned to each student. Graduate students will find at least one (and preferably more) scholarly articles that address the topic or that the news article is based on and answer question related to the validity of the news article. The questions will be generated by the undergraduate students who will be given five minutes to generate questions in writing about the topic and then randomly chosen to ask the graduate presenter. Graduate students will upload a link to the news article being summarized and at least one peer reviewed journal article or report the eludicates information in the news. This assignment is worth 5% of the final grade.

Risk Assessment Presentation
Graduate students will make a 15 minute seminar type presentation that characterizes the risk of a pesticide active ingredient. Students can choose to focus on human health risk or on ecological risk. Graduate students will use EPA registration eligibility decision documents as the main basis for reviewing the risk, but in addition, they will find literature that validates at least one aspect of the industry data that EPA has assessed. Thus, the expectations for the oral presentation include coverage of the following topics: chemical name of active ingredient; typical formulations and use patterns; toxicological profile and benchmark doses (also known as points of departure or NOAELs [no observable adverse effects level]); exposure assessment; risk characterization (in the form of MOEs or RQs). Students will also find at least one research article that has analyzed either the hazard and/or risk of the pesticide to a nontarget organism and summarize the information in one or two slides. The presentations will be scheduled during the last two periods of the class. Students will upload their presentation to the designated drop box in the Lesson subfolder, ‘Graduate Student Risk Assessment Presentation’. Also, students will upload the research paper to the drop box. This assignment is worth 15% of the final grade.
<table>
<thead>
<tr>
<th>Student Learning Objectives (# corresponding to full narrative description)</th>
<th>Undergraduate Student Assessment (% Value)</th>
<th>Graduate Student Assessment (% Value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explain functions of pesticide laws &amp; amendments (1)</td>
<td>Exam 1 (20%); Challenge Assignment 1 (CA1) (8%)</td>
<td>Exam 1 (20%); Challenge Assignment 1 (CA1) (4%)</td>
</tr>
<tr>
<td>Discuss benefits of pesticides for protecting crop yield and public health (2)</td>
<td>Exam 1 (20%)</td>
<td>Exam 1 (20%)</td>
</tr>
<tr>
<td>Differentiate terms used in regulations to describe pesticide types, active ingredients, formulations (3)</td>
<td>Exam 1 (20%)</td>
<td>Exam 1 (20%)</td>
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<tr>
<td>Read and interpret product labels (4)</td>
<td>Exam 1 (20%)</td>
<td>Exam 1 (20%)</td>
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<tr>
<td>Describe function of formulations &amp; adjuvants (5)</td>
<td>Exam 1 (20%)</td>
<td>Exam 1s (20%)</td>
</tr>
<tr>
<td>Explain physical chemistry principles that drive environmental behavior of pesticides (6)</td>
<td>Exam 1 (20%); CA 3 (8%)</td>
<td>Exam 1 (20%); CA 3 (4%)</td>
</tr>
<tr>
<td>Differentiate meaning &amp; use of terms toxicity, hazard, risk (7)</td>
<td>Exam 1 (20%)</td>
<td>Exam 1 (20%)</td>
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<tr>
<td>Interpret dose-response curve; derive benchmarks of toxicity (8)</td>
<td>Exam 1 &amp; 2 (40%)</td>
<td>Exam 1 &amp; 2 (40%)</td>
</tr>
<tr>
<td>Name main pesticide classes and describe function and biochemical basis of toxicity (9)</td>
<td>Exam 1 (20%)</td>
<td>Exam 1 (20%)</td>
</tr>
<tr>
<td>Explain concept of selectivity &amp; role of toxicokinetics and toxicodynamics (10)</td>
<td>Exam 1 &amp; 2 (40%); CA 2 (6%); CA 2 (4%)</td>
<td>Exam 1 &amp; 2 (40%); CA 2 (4%)</td>
</tr>
<tr>
<td>Describe hazards of pesticide to human health &amp; relation to risk (11)</td>
<td>Exam 2 (20%); CA 4 (8%); CA 4 (4%)</td>
<td>Exam 2 (20%); CA 4 (4%)</td>
</tr>
<tr>
<td>Describe present controversies regarding effects of pesticides on wildlife (12)</td>
<td>Exam 2 (20%); CA 5 (8%); CA 5 (4%)</td>
<td>Exam 2 (20%); CA 5 (4%)</td>
</tr>
<tr>
<td>Read, interpret, summarize scholarly journal articles about pesticides (13)</td>
<td>Exam 2 (20%)</td>
<td>Exam 2 (20%)</td>
</tr>
<tr>
<td>Locate scholarly journal literature that supports or refutes media stories (14)</td>
<td>News Analysis &amp; Validation Rept (20%)</td>
<td>News Analysis &amp; Validation Rept (20%)</td>
</tr>
<tr>
<td>Analyze contemporary media story and lead discussion of the validity of the story (15)</td>
<td>—</td>
<td>Oral discussion; ability to engage class (5%)</td>
</tr>
<tr>
<td>Student Learning Objectives (# corresponding to full narrative description)</td>
<td>Undergraduate Student Assessment (% Value)</td>
<td>Graduate Student Assessment (% Value)</td>
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<tr>
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<tr>
<td>Risk assessment of ecological effects of a pesticide (16)</td>
<td>—</td>
<td>Seminar (15%)</td>
</tr>
</tbody>
</table>

**Final Grade Determination**

The final grade will be determined by normalization of all exam and assignment values to a 100 point basis. The assessments and value point for undergraduate and graduate students are differentiated below.

<table>
<thead>
<tr>
<th>Assessment Tool</th>
<th>Undergraduate Student Points</th>
<th>Graduate Student Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exams (n=2)</td>
<td>20 pts each; 40 pts total</td>
<td>20 pts each; 40 pts total</td>
</tr>
<tr>
<td>Challenge Assignments (n=5)</td>
<td>8 pts each; 40 pts total</td>
<td>4 pts each; 20 pts total</td>
</tr>
<tr>
<td>News Analysis &amp; Validation Rept</td>
<td>20 pts each</td>
<td>20 pts</td>
</tr>
<tr>
<td>News Summary Oral Presentation &amp; Discussion</td>
<td>—</td>
<td>5 pts</td>
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<tr>
<td>Risk Assessment Presentation</td>
<td>—</td>
<td>15 pts</td>
</tr>
<tr>
<td>Total Cumulative Points</td>
<td>100 pts</td>
<td>100 pts</td>
</tr>
</tbody>
</table>

A letter grade for the course will be assigned as follows based on the accumulation of points on the individual exams and assignments.

**A** (95-100); **A-** (90-94); **B+** (85-89); **B** (80-84); **B-** (75-79); **C+** (70-74); **C** (65-69); **C-** (60-64); **D** (50-59); **F** (<50)

*Note: I am not inclined to issue an incomplete (I) grade. A student requesting an incomplete will be required to petition me in writing with a valid excuse. Valid excuses involve health issues, family issues, and military service.*

**Academic Integrity Expectations Statement**

As stated in the WSU Tri-Cities Student Handbook, "any member of the University community who witnesses an apparent act of academic dishonesty shall report the act either to the instructor responsible for the course or activity or to the Office of Student Affairs." The Handbook defines academic dishonesty to include "cheating, falsification, fabrication, multiple submission [e.g., submitting the same or slightly revised paper or oral report to different courses as a new piece of work], plagiarism, abuse of academic material, complicity, or misconduct in research."
Unless otherwise specified, students may work with classmates on assignments. However, each student must turn in original work. No copying will be accepted. Students who violate WSU's Standards of Conduct for Students will receive an F as a final grade in this course, will not have the option to withdraw from the course and will be reported to the Office Student Standards and Accountability. Cheating is defined in the Standards for Student Conduct WAC 504-26-010 (3). Students are expected to read and understand these definitions, which can be found at URL http://apps.leg.wa.gov/wac/default.aspx?cite=504-26-010.

Disability Services Reasonable Accommodations Statement

Reasonable accommodations are available for students who have a documented disability. Classroom accommodation forms are available through the Disability Services Office. If you have a documented disability, even temporary, make an appointment as soon as possible with the Disability Services Coordinator, Cherish Tijerina (West 269J, 509-372-7352, ctijerina@tricity.wsu.edu) on the Tri-Cities campus. In Pullman, contact the Disabilities Resource Center located in Room 217 of the Washington Building; stop by or call 509-335-3417 to make an appointment with a disability specialist. You will need to provide your instructor with the appropriate classroom accommodation form. The form should be completed and submitted during the first week of class. Late notification can delay your accommodations or cause them to be unavailable. All accommodations for disabilities must be approved through the Disability Services Coordinator.

Campus Safety Statement

WSU Tri-Cities and Pullman campuses are committed to maintaining a safe environment for its faculty, staff and students. The WSU TC Campus Safety Plan can be found at http://www.tricity.wsu.edu/safetyplan/, and the WSU Pullman plan is located at http://safetyplan.wsu.edu/. See also the WSU Office of Emergency Management site at http://oem.wsu.edu. Up-to-date WSU emergency alerts are available at http://alert.wsu.edu. You can sign up for emergency alerts through the MyWSU site (which is the zzusis portal (http://my.wsu.edu).

The Writing Center

WSU offers help and guidance with student writing assignments, as well as provides other tutorial services. Information about the Pullman based Writing Center can be accessed via URL: http://universitycollege.wsu.edu/units/writingprogram/units/writingcenter/undergrad/. Information about the TC program is at URL: http://www.tricity.wsu.edu/writingcenter/. Walk-ins are welcome (Smith CUE 303 @ Pullman; 2nd Floor CIC @ Tri-Cities).
<table>
<thead>
<tr>
<th>Date</th>
<th>Lecture</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>13-Jan</td>
<td>1</td>
<td>Course Overview; Why We Use Pesticides; Pesticide Benefits &amp; Limitations</td>
</tr>
<tr>
<td>15-Jan</td>
<td>2</td>
<td>Rationale for Pesticide Regulations; FIFRA; FFDCRA; FEPCA; FQPA; Where's the Data? (Note that CA1 is due 20 Jan @ 11 pm)</td>
</tr>
<tr>
<td>20-Jan</td>
<td>3</td>
<td>Fundamental Concepts of Toxicity, Hazard, Risk; Testing &amp; Data Requirements for Risk Assessment</td>
</tr>
<tr>
<td>22-Jan</td>
<td>4</td>
<td>Why Pesticides Can Be Selective (Concepts of Toxicokinetics &amp; Toxicodynamics)</td>
</tr>
<tr>
<td>27-Jan</td>
<td>5</td>
<td>Pesticide Classes: Insecticides &amp; Acaricides</td>
</tr>
<tr>
<td>29-Jan</td>
<td>6</td>
<td>Pesticide Classes: Plant Incorporated Protectants (PIPs) (One Category of Biopesticides)</td>
</tr>
<tr>
<td>3-Feb</td>
<td>7</td>
<td>Pesticide Classes: Herbicides                                     (Note that CA2 is due 10 Feb @ 11 pm)</td>
</tr>
<tr>
<td>5-Feb</td>
<td>8</td>
<td>Pesticide Classes: Fungicides and Miscellaneous</td>
</tr>
<tr>
<td>10-Feb</td>
<td>9</td>
<td>Pesticide Formulation Technology &amp; Application</td>
</tr>
<tr>
<td>12-Feb</td>
<td>10</td>
<td>Pesticide Product Labeling; Problems of Pest Resistance</td>
</tr>
<tr>
<td>17-Feb</td>
<td>11</td>
<td>Fundamental Concepts of Environmental Behavior                     (Environmental Chemodynamics)</td>
</tr>
<tr>
<td>19-Feb</td>
<td>12</td>
<td>Fundamental Concepts of Environmental Behavior                     (Environmental Chemodynamics)</td>
</tr>
<tr>
<td>24-Feb</td>
<td>13</td>
<td>Pesticide Residues in Food                                        On-line EXAM 1, open at 8 am; closes 25 Feb at 11 pm</td>
</tr>
<tr>
<td>26-Feb</td>
<td>14</td>
<td>Pesticide Residues in Soil &amp; Water</td>
</tr>
<tr>
<td>3-Mar</td>
<td>15</td>
<td>Pesticide Residues in Air; Pesticide Drift</td>
</tr>
<tr>
<td>5-Mar</td>
<td>16</td>
<td>Health Hazards: Required Testing; Nervous System Effects</td>
</tr>
<tr>
<td>10-Mar</td>
<td>17</td>
<td>Health Hazards: Endocrine System (Potential for Developmental, Reproductive, &amp; Immune System Effects) (Note that CA3 is due today at 11 pm)</td>
</tr>
<tr>
<td>Date</td>
<td>Lecture</td>
<td>Topic</td>
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<tr>
<td>12-Mar</td>
<td>18</td>
<td>Health Hazards: Cancer &amp; Epidemiological Studies</td>
</tr>
<tr>
<td>17-Mar</td>
<td></td>
<td><strong>No Class, Spring Break</strong></td>
</tr>
<tr>
<td>19-Mar</td>
<td></td>
<td><strong>No Class, Spring Break</strong></td>
</tr>
<tr>
<td>24-Mar</td>
<td>19</td>
<td>Health Hazards: Plant Incorporated Protectants</td>
</tr>
<tr>
<td>26-Mar</td>
<td>20</td>
<td>EPA Risk Assessment Procedures for Human Health Protection</td>
</tr>
<tr>
<td>31-Mar</td>
<td>21</td>
<td>Graduate Student Oral Presentations of News Summaries re Human Health Topics</td>
</tr>
<tr>
<td>2-Apr</td>
<td>22</td>
<td>Ecological Effects: Sentinel Species and Basic Bioassays (Note that CA4 is due today at 11 pm)</td>
</tr>
<tr>
<td>7-Apr</td>
<td>23</td>
<td>Revisiting Silent Spring: Birds &amp; Pesticides</td>
</tr>
<tr>
<td>9-Apr</td>
<td>24</td>
<td>Endangered Species &amp; Pesticides; Focus on Salmon</td>
</tr>
<tr>
<td>14-Apr</td>
<td>25</td>
<td>Frogs &amp; Pesticides</td>
</tr>
<tr>
<td>16-Apr</td>
<td>26</td>
<td>Bees &amp; Pesticides</td>
</tr>
<tr>
<td>21-Apr</td>
<td>27</td>
<td>Ecological Studies of Plant Incorporated Protectants</td>
</tr>
<tr>
<td>23-Apr</td>
<td>28</td>
<td>EPA Risk Assessment Procedures for Ecological Protection (Note that CA5 is due today at 11 pm)</td>
</tr>
<tr>
<td>28-Apr</td>
<td>29</td>
<td>Graduate Student Risk Assessment Presentations</td>
</tr>
<tr>
<td>30-Apr</td>
<td>30</td>
<td>Graduate Student Risk Assessment Presentations</td>
</tr>
<tr>
<td>4-May</td>
<td></td>
<td>Finals Week Begins (May 5 - 10, 2014)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>News Analysis &amp; Validation Report due to drop box by 11 pm</td>
</tr>
<tr>
<td>5-May</td>
<td></td>
<td>On-line EXAM 2; open 5 May @ 8 am, closes 6 May @ 11 pm</td>
</tr>
</tbody>
</table>

* I reserve the right to alter the lecture schedule as needed.
Examples of Challenge Assignments Used During Spring 2014

**Challenge Assignment 1: Template for Answering the Challenge**

Find a news story that depicts a violation of established pesticide laws either at the State or Federal Level. List the correct bibliographic citation for the article. The citation will include a link for the news article. (Note: the WSU library has on-line style guides for properly citing bibliographic information from a wide variety of different sources. The preferred style is from the Council for Science Editors (CSE); you can access this information at URL [http://www.wsulibs.wsu.edu/quickguides/cse](http://www.wsulibs.wsu.edu/quickguides/cse). Use the Name Year convention.)

To get you started in your search strategy, use GOOGLE and the search string `news pesticide violations`. In your own words, summarize the story in 300 words or less. At the end of your summary, indicate explicitly what regulation or statute was violated. Suggest how the violation of the rules might have been avoided.

**Bibliographic Citation for the New Article:**

**Summary of Story (300 words or less):**

What regulation or statute was broken?

How could violation of the rules been avoided?

**Challenge Assignment 2: Template for Answering the Challenge**

Locate a scholarly journal article (i.e., a peer reviewed article published in a journal, **NOT** a blog or website report) that has conducted research that elucidates or proves selectivity* of a pesticide. Provide the correct bibliographic citation for the article (see citation formatting at URL [http://www.wsulibs.wsu.edu/quickguides/cse](http://www.wsulibs.wsu.edu/quickguides/cse); use the Name Year convention). Fill in the template below.

[*Selectivity for purposes of this assignment can be selectivity among different pests or selectivity between pests and nontarget organisms. You could also choose an article that elucidates the biochemical mechanism of toxicity (i.e., pharmacodynamics) and then by considering whether this mechanism is similar or absent in nontarget organisms make a conclusion as to why the chosen pesticide is selective.*]

- Correctly formatted bibliographic citation
- Hypothesis or objective of the research (summarize it in your own words)
- Methods (a brief overview; delineate the independent variables and the dependent variables)
- Results (what did the authors observe)
- Your conclusions as to why the pesticide is selective
- **Important:** Upload to the drop box the research paper that you chose to analyze.
Challenge Assignment 3: Template for Answering the Challenge

Choose any two pesticide active ingredients within a major pesticide class (i.e., either pick two insecticides, two herbicides, etc.). Fill in the information below for each chemical. When you list the physiochemical properties, show the units for the quantity that you are reporting. After listing the properties, make a conclusion as to which chemical is less persistent in the environment, which chemical is less likely to leach to shallow ground water, and which chemical is less likely to volatilize into air.

- Water Solubility Chemical 1 & Chemical 2 (List source of information)
- Vapor Pressure Chemical 1 & Chemical 2 (List source of information)
- Henry's Law Coefficient Chemical 1 & Chemical 2 (List source of information)
- Soil-Water Distribution Coefficient Chemical 1 & Chemical 2 (List source of information)
- Half-life in aerobic soil Chemical 1 & Chemical 2 (List source of information)

Which chemical is likely to degrade or dissipate most quickly at its site of application?

Which chemical is least likely to leach to shallow ground water?

Which chemical is least likely to volatilize into air?

- Important: Don’t forget to include the specific source of information that you used to find the properties. If you used the same source for all properties, just make a statement that all information came from that source.

- Although you can find these properties by doing a GOOGLE search using a string like, “pesticide name, water solubility”, a comprehensive database called the IUPAC Pesticide Properties Database (former name, FOOTPRINT) has most if not all of these properties. The URL for the PPDB is http://sitem.herts.ac.uk/aeru/iupac/9.htm. The EPA reregistration eligibility decision website has links to documents with most if not all of these properties. The URL is http://www.epa.gov/oppsrrd1/reregistration/status.htm.

Challenge Assignment 4 (CA4): Template for Answering the Challenge

Find a scholarly journal article that has experimentally studied a health hazard of a pesticide or a PIP (plant incorporated protectant). Provide information for each element below.

- Correctly formatted bibliographic citation (see http://www.wsulibs.wsu.edu/quickguides/cse for style information)
- What is the common name of the pesticide(s) studied? For a PIP, identify the toxic protein.
- What is the pesticidal biochemical mode of action (toxicodynamics)?
• What is the hypothesis or objective of the research paper you've chosen?
• What is the test organism?
• What are the doses of pesticide that were tested (show units)?
• Are these doses similar to what a human might be exposed to? (You must validate your answer by referencing the source(s) that you used to check potential exposures.)
• What are the authors measuring (i.e., what is the dependent variable(s))? 
• What are the author's conclusions?
• Upload to the drop box the research paper that you chose to analyze.

**Challenge Assignment 5 (CA5): Template for Answering the Challenge**

Find a scholarly journal article that has experimentally studied the hazard of a pesticide to salmon, frogs, bees, or a bird. Provide information for each element below.

• What is the common name of the pesticide(s) studied?
• What is the pesticidal biochemical mode of action (toxicodynamics)?
• What is the hypothesis or objective of the research paper you've chosen?
• What is the test organism?
• What are the doses or concentration of pesticide that were tested (show units)?
• Are these doses or concentrations similar to what a nontarget organism might be exposed to? (You must validate your answer by referencing the source(s) that you used to check potential exposures.)
• What are the authors measuring (i.e., what is the dependent variable(s))? 
• What are the author's conclusions?
• Upload to the drop box the research paper that you chose to analyze.