SUBMITTED BY:
Department: Biology and Wildfire; Chemistry and Biochemistry
Prepared by: Todd O'Hara & Tom Trainor
Email/Contact: TMO@uaaf.edu, TTTFPT@uaaf.edu

1. COURSE IDENTIFICATION:
Dept: CHEM, Course #: 655, No. of Credits: 3
COURSE TITLE: Environmental Biochemistry and Toxicology (original title)

2. ACTION DESIRED:
Change Course: X If Change, indicate below what change.
Drop Course

3. COURSE FORMAT
NOTE: Course hours may not be compressed into fewer than three days per credit. Any course compressed into fewer than six weeks must be approved by the college or school's curriculum council. Furthermore, any core course compressed to less than six weeks must be approved by the core review committee.

COURSE FORMAT: (check one)
☑️ 1 2 3 4 5 6
☑️ 6 weeks to full semester

Mode of delivery (specify lecture, field trips, labs, etc)
Mostly lecture, occasional local field trips, no labs.

4. COURSE CLASSIFICATIONS: (undergraduate courses only. Use approved criteria found on Page 10 & 17 of the manual. If justification is needed, attach on separate sheet.)

H = Humanities
N = Natural Science
S = Social Sciences

Will this course be used to fulfill a requirement for the baccalaureate core? YES ☑️ NO

IF YES, check which core requirements it could be used to fulfill:
O = Oral Intensive, Format 6
W = Writing Intensive, Format 7
X = Natural Science, Format 8

5. COURSE REPEATABILITY:
Is this course repeatable for credit? YES ☑️ NO

Justification: Indicate why the course can be repeated (for example, the course follows a different theme each time).

How many times may the course be repeated for credit? TIMES
If the course can be repeated with variable credit, what is the maximum number of credit hours that may be earned for this course? □ CREDITS

6. CURRENT CATALOG DESCRIPTION AS IT APPEARS IN THE CATALOG: including dept., number, title and credits

CHEM F655 Environmental Biochemistry and Toxicology

3 Credits  Offered Fall Even-numbered Years

Environmental biochemistry where the environment is broadly defined to include the home, the workplace and lifestyle, as well as the great out-of-doors. A major focus will be on those general properties and principles which determine how poisonous (toxic) various chemicals are. Major natural and synthetic chemicals in the environment of developed and developing countries will be reviewed. Special fees apply. Prerequisites: CHEM F451 or equivalent biology course. (3+0)

7. COMPLETE CATALOG DESCRIPTION AS IT WILL APPEAR WITH THESE CHANGES: (Underline new wording, strike-through old wording and use complete catalog format including dept., number, title, credits and cross-listed and stacked.) PLEASE SUBMIT NEW COURSE SYLLABUS. For stacked courses the syllabus must clearly indicate differences in required work and evaluation for students at different levels.

CHEM F655 Environmental Biochemistry and Toxicology

3 Credits  Offered Fall Spring Even-numbered Years

Environmental biochemistry where the environment is broadly defined to include the home, the workplace and lifestyle, as well as the great out-of-doors. A major focus will be on those general properties and principles which determine how poisonous (toxic) various chemicals are. Major natural and synthetic chemicals in the environment of developed and developing countries will be reviewed. Toxicology will focus on the general properties and principles of persistent and/or poisonous (toxic) chemicals commonly encountered in air, water, fish and wildlife. Numerous natural and synthetic chemicals in the environment will be discussed from a global perspective with some bias towards arctic and subarctic regions. Special fees apply. Prerequisites: CHEM F451 or equivalent biology course. (3+0) BIOL F303; or one semester each of organic chemistry and cell or molecular biology; or permission of instructor. (Cross-listed with BIOL F655. Stacked with CHEM F455; BIOL F455.) (3 + 0)

8. IS THIS COURSE CURRENTLY CROSS-LISTED?

YES/NO □ N    If Yes, DEPT _______ NUMBER _______

(Requires written notification of each department and dean involved. Attach
10. **ESTIMATED IMPACT**
WHAT IMPACT, IF ANY, WILL THIS HAVE ON BUDGET, FACILITIES/SPACE, FACULTY, ETC.

BIOL makes the commitment of faculty workload to teach the course – the intent will be team teaching for this course in the future with contribution from both departments (BIOL and CHEM).

11. **LIBRARY COLLECTIONS**
Have you contacted the library collection development officer (ffklj@uaf.edu, 474-6695) with regard to the adequacy of library/media collections, equipment, and services available for the proposed course? If so, give date of contact and resolution. If not, explain why not.

| No | X | Yes |

12. **IMPACTS ON PROGRAMS/DEPTS:**
What programs/departments will be affected by this proposed action?

*Include information on the Programs/Departments contacted (e.g., email, memo)*

This change directly impacts the Department of Chemistry and Biochemistry, Environmental Chemistry Program (Chair Prof. John Keller, ffrwk@uaf.edu) and the Department of Biology and Wildlife (Chair Prof. Rich Boone, ffrdb@uaf.edu).

13. **POSITIVE AND NEGATIVE IMPACTS**
Please specify positive and negative impacts on other courses, programs and departments resulting from the proposed action.

**Positive:**
This course is intended to become a core course within the Environmental Chemistry graduate program, serving as the focal point for a newly developed focus area in “Environmental Toxicology and Fate”. This focus area will help to enhance collaboration and interaction between faculty in Chemistry, Biochemistry and Biology & Wildlife and provide opportunities for students in an area of opportunity that is currently under-represented. B&W currently trains numerous students in the field of toxicology and will benefit from a regularly offered course.

**Negative:**
This course will require teaching commitments from both Chemistry and Biochemistry and Biology and Wildlife. The intent is to team teach the course to both broaden the course focus, and spread the teaching load. Dr. O’Hara is committed to a course in Wildlife Diseases and this new teaching load should not impact that.

**JUSTIFICATION FOR ACTION REQUESTED**
The purpose of the department and campus-wide curriculum committees is to scrutinize course change and new course applications to make sure that the quality of UAF education is not lowered as a result of the proposed change. Please address this in your response. This section needs to be self-explanatory. If you ask for a change in # of credits, explain why; are you increasing the amount of material covered in the class? If you drop a prerequisite, is it because the material is covered elsewhere? If course is changing to stacked (400/600), explain higher level of effort and performance required on part of students earning graduate credit. Use as much space as needed to fully justify the proposed change and explain what has been done to ensure that the quality of the course is not compromised as a result.

The existing CHEM 655 course is in need of new instructors since the past teacher has moved into an Administrative position.

A regularly offered environmental toxicology course will help fill a currently under-represented niche at UAF. This course will be used as a core component of a newly developed Environmental Toxicology and Contaminants focus area within the Environmental Chemistry program – which includes faculty from both Chemistry and Biochemistry and Biology and Wildlife. It will also serve as a complement to current degree programs in Chemistry and Biochemistry and Biology and Wildlife, among other programs and departments, and therefore should have broad cross-campus appeal. Cross-listing the course highlights the fact that this is a highly interdisciplinary topic area and will benefit from a cooperative effort by Chemistry and Biology. The cooperative/team teaching model will also give students access to both the biological and...
chemistry expertise we have to offer in the area of toxicology.

Graduate level credit will be earned via tests, oral presentations (O, 10 minutes each), and associated papers (W, 10-12 pages) as for the undergraduates. However, graduate student papers will require analyses of data (e.g., statistics) and hypothesis driven papers (W, 15-20 pages) and presentations (O, 20 minutes each), these products will be double the point value as compared to the undergraduates. For written examinations, there will an additional in-depth essay question for the graduate students (in addition to undergraduate exam but within same time frame for testing). Graduate students must perform very well with respect to written and oral assignments.

APPROVALS:

Richard D. Boone, Biology & Wildlife

Date: 2/11/09

Signature, Chair, Program/Department of: Richard Boone, Biology & Wildlife

Date: 2/25/09

Signature, Chair, College/School Curriculum Council for: Diane Wagner, CNSM

Date: 3/4/09

Signature, Dean, College/School of: Paul Layer, Interim Dean, CNSM

Signature of Provost (if applicable)

Offerings above the level of approved programs must be approved in advance by the Provost.

ALL SIGNATURES MUST BE OBTAINED PRIOR TO SUBMISSION TO THE GOVERNANCE OFFICE.

Signature, Chair, UAF Faculty Senate Curriculum Review Committee

ADDITIONAL SIGNATURES: (If required)

Chemistry & Biochemistry

Date: 2/9/09

Signature, Chair, Program/Department of: Chemistry & Biochemistry

Signature, Chair, College/School Curriculum Council for: Diane Wagner, CNSM

Date: 3/4/09

Signature, Dean, College/School of: Paul Layer, Interim Dean, CNSM
Environmental Toxicology
3 credit hours (lecture only)
February 22 2009; DRAFT version (living document subject to change)

CHEM 455/655, BIOL F(TBD, propose 455/655); Lecture Reichardt TBD (unless otherwise indicated, for example – tours, wet lab exercises, etc.)

Instructor: Todd O’Hara. fftmo@uaf.edu
Phone – 474-1838; Arctic Health Research Building 147; Office Hours TBD
Teaching Assistants: B&W Teaching Assistant unlikely since there is no laboratory
Post Doctoral research assistants and guest speakers from local agencies (e.g., Alaska Department of Environmental Conservation).

Location TBD, meeting time (suggest T and Th blocks to allow for longer periods for demonstrations and guest lectures)

3 Credits Offered Alternating Years (start spring 2010), thus offer every even numbered year.

Reading required: Fundamentals of Ecotoxicology by Michael C. Newman, Michael A. Unger, Lewis Publishers (2003 or later); 458 pages. No Supplementary reading required for purchase, primary literature will be provided by instructors.

Environmental toxicology will focus on the general properties and principles of persistent and/or toxic chemicals commonly encountered in air, water, fish and wildlife. Numerous natural and synthetic chemicals in the environment will be discussed from a global perspective with some bias towards arctic and subarctic regions. Special fees do not apply. Prerequisites: CHEM F451; or BIOL F303; or one semester each of organic chemistry and cell or molecular biology; or permission of instructor.

Numerous graduate students study environmental contaminants across many Departments and require a basic course to better understand the principles that underlie their research and for the more specialized courses they may take. This toxicology course combines aspects of environmental science, vertebrate physiology and environmental chemistry in a manner to understand how systems are impacted and function.

Outcomes:
Biology students will have a better understanding of chemistry with respect to environmental contaminants and that helps them better assess biotic interactions with chemical components.
For chemistry students they will acquire a better understanding of the chemical-biotic interactions and how biota alters the structure and dynamics of contaminants in the diverse ecosystems of the North.

We will break down the barriers and mystery of chemistry for the biologists and biology for the chemists giving them the opportunity to interact and learn from each other.

1) This course will provide the basic foundations for Environmental Toxicology
2) The O and W exercises will allow students to focus on specific aspects of Environmental Toxicology that interests them with intensive feedback from the Instructor and others (e.g., classmates).
3) A better appreciation of the complexity of contaminant interactions in high latitude systems.
Origin and mission: This course is encouraged and sponsored by the Department of Chemistry and Biochemistry, and the Department of Biology and Wildlife to fill an important niche for addressing “contaminants in the environment and related biota.”

Grading: Course is taken for a letter grade, and possibly audit (no + and – grades). This course is targeting undergraduate and graduate students with an interest or research project in “Toxicology”, but anyone (agency biologists, managers, industry representatives, etc.) is eligible. Please contact Todd O’Hara for more information (fflmo@ualaska.edu, office 907-474-1838).

The ideal class size will be 12 students (or less) so we can accommodate the class with respect to field trips (visiting and working in research laboratories, tours of facilities, constructive discussion groups, presentation logistics, etc.), and to allow oral and written exercises (W, O course).

Exams:
Three examinations that will focus on the 3 major sections will be administered.
Each exam is 100 points (3 * 100 points = 300 points for exams) and will be multiple choice, true or false, and short essay format. The emphasis will be on writing. For each exam 60 points will emphasize writing, thus 180 points of the 300.

Two oral presentations (O, 20 minutes each) and two written exercises (W, 10-12 pages) will count as 50 points each (200 points total). During oral presentations we will have the entire class present and invite other students and faculty with the expectation to have > 12 members in the audience (minimum of 5). Part of the grade for students will be participation during the Q&AW session; they must be engaged for credit. It will be indicated that presentations must have a clear “introduction-body-conclusion” organization, appropriate to Environmental Toxicology and all will include visual aids. All presentations will receive evaluation by the instructor on oral communication competency (including responsiveness to audience questions), as well as on subject mastery. This can be done since students receive information/instruction in this course on effective speaking, effective responding, organization of material for effective presentation, and on development and use of media and visual aids. The two written exercises (W, 10-12 pages) will undergo stages of review (with feedback to students) and at least one meeting to speak with the student about his or her writing. The first assignment allows for instructor review with no grading so as to assist with instructions on scientific writing (a student would be wise to take advantage of this opportunity). The second written assignment initial review will compromise 33.3% of the grade. Grading will consider the ultimate product quality and how the student responds to critical review. [WRITING INTENSIVE “C”, “D”]

Quizzes (announced and “surprise”) and homework assignments will be an additional 100 points and are mostly based on discussion activities. A quiz will typically cover the past week of lectures/presentations to highlight major points, and homework will involve specific questions and/or reading assignments the students will be expected to discuss as well as turn in answers or reviews. For example, we distribute a controversial paper on mercury in fish and ask students to choose a position on whether they should allow human consumption, or not. They must then defend their decision. It is not the decision they make that is graded but how they can articulate their perspective and defense of the decision.

<table>
<thead>
<tr>
<th>Exams</th>
<th>300 points [180 points for writing]</th>
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<tr>
<td>W and O assignments</td>
<td>200 points [WRITING INTENSIVE “A”, “B”]</td>
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<tr>
<td>Quizzes, homework, etc.</td>
<td>100 points [5 quizzes/5 homework, 10 pts each, all essay writing]</td>
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<tr>
<td>Undergraduate Total</td>
<td>600 points [480 points of writing, 80%]</td>
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Graduate level credit will be earned via tests, oral presentations, and associated papers as for the undergraduates. However, graduate student papers will require analyses of data (e.g., statistics) and hypothesis driven papers (W, 15-20 pages) and presentations (O, 20 minutes each), these products will be double the point value as compared to the undergraduates and intensively scrutinized by 2-3 faculty members (guest reviewers). For written examinations, there will be an additional in-depth essay question for the graduate students (in addition to undergraduate exam but within same time frame for testing). Graduate students must perform very well with respect to written and oral assignments.

Exams 300 points
W and O assignments 400 points [WRITING INTENSIVE “A”, “B”]
Quizzes, homework, etc. 100 points [5 quizzes and 5 home works spaced in between exams, 10 pts each]
Undergraduate Total 800 points

Audit: attend approximately 80% of course and take all exams (no minimum score required). We are very flexible on this. All students must be registered to attend.

100-90% = A, 89-80% = B; 79-70% = C; 69-55% = D; <55% fails. No plus or minus grades. “Curving” will be considered but not likely needed.

Class schedule:
Tuesday and Thursday schedule is ideal to allow a class period long enough to accommodate the presentations and field trips.

Since participation is important a part of the evaluation (grade) via written and oral assignments this clearly requires attendance. Excused absences will certainly be honored as compared to absence with no prior warning. Make up or remote examinations are permitted with permission of the Instructor.

Plagiarism is not tolerated. When in doubt, properly cite the source.

Student Support Services include:

Disabilities Services: The Office of Disability Services implements the Americans with Disabilities Act (ADA), and insures that UAF students have equal access to the campus and course materials. This course works with the Office of Disabilities Services (203 WHIT, 474-7043) to provide reasonable accommodation to students with disabilities.”

Writing Center: The center is located on the eighth floor of the Gruening Building. Students can receive help at the center at any stage in their writing process, from brainstorming to final editing. Tutors are available for one-on-one sessions and can help students with grammar, spelling, punctuation, organization, and style. Tutors are also available to visit your classroom to talk about Writing Center services. Students who visit the center should bring a clean draft of the paper they're working on (double-spaced) and a copy of the instructor's assignment sheet. For more information, call Martha Bristow or Steve Carter at 474-5314.
Env. Toxicology Course Outline

Section 1: Nuts and Bolts of Environmental Toxicology.

Lectures 1 and 2: Introduction to Environmental Toxicology (O’Hara)

*Purpose is for leveling: to bring students to a certain level of basic toxicology understanding. In other words, get the chemistry students thinking biologically; and get the biology students thinking chemically!*

Lectures 3, 4 and 5 (O’Hara)

Definitions and Basic Principles of Env Tox (the foundation of the course)

Lecture 6 (O’Hara)

Field Trip: Timothy S. Howe, Research Professional Alaska Stable Isotope Facility Water & Environmental Research Center, University of Alaska Fairbanks

Lectures 7 and 8

Whole animal and environmental toxicology (Hg as the example toxicant, along with other metals)

Lecture 9 Exam 1 (Lectures 1-8)

Section 2 “Mechanisms” of Environmental Toxicants

Lectures 9 and 10
Mechanisms of Toxicity:
   A) Interaction with Target B) Cellular dysfunction and toxicity C) Repair or Disrepair

Lecture 11 and 12:
   A) Carcinogenesis B) Genetic Toxicology

Lectures 13 and 14 oral presentations by students, written reports handed in.

Lecture 15 Toxicology Organ directed toxicity: Too many organs to do them all, overview of all and select a few organs for details including liver, kidney and brain.

Lecture 16: Exam 2 (Lectures 9-15)

Section 3 Interpreting/ Understanding/ Managing Environmental Toxicants (Observed Concentrations)

Lecture 17-20: Organohalogens in fish and mammals, some other organics as well (e.g., antibiotics).

Lecture 20-24: Heavy Metals in fish and mammals.

Lecture 25: Radionuclides in fish and mammals.

Lecture 26-27 oral presentations by students, written reports handed in.

Lecture 28 - Review
EXAM 3 (Final, lectures 17-28): TBD