



**Ohio Agricultural Research  
and Development Center**

**Department of Entomology**  
1680 Madison Avenue  
Wooster, Ohio 44691-4096  
Phone 330-263-3725  
Fax 330-263-3686

Date: October 19, 2006

To: Curriculum Committee, College of Biological Sciences

From: Ronald B. Hammond  
Curriculum Committee, Chair  
Department of Entomology

Subject: New Course Request for Entomology 597

Attached is a new course request for Entomology 597, Environmental, Human, and Social Impacts of Chemical and Biological Pollutants. Drs. Clive Edwards and Joe Kovach from our department will offer this course. It is intended to be taught to undergraduates this coming spring, and in the summer to high school teachers.

Our curriculum committee has discussed this request and is in full agreement with it.

If you have any questions, feel free to contact me at 330-263-3727 or at [hammond.5@osu.edu](mailto:hammond.5@osu.edu).

Thank you.

cc. S. Fisher  
C. Edwards  
J. Kovach

<b>The Ohio State University</b> <b>Colleges of the Arts and Sciences New Course Request</b>
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Entomology

Academic Unit

Book 3 Listing (e.g., Portuguese)

597 Environmental, Human, and Social Impacts of Chemical and Biological Pollutants

Number Title

Impacts of Pollutants

UG

5

18-Character Title Abbreviation

Level

Credit Hours

Summer X Autumn Winter Spring X Year 2007

Proposed effective date, choose one quarter and put an "X" after it; and fill in the year. See the OAA curriculum manual for deadlines.

**A. Course Offerings Bulletin Information**

Follow the instructions in the OAA curriculum manual. If this is a course with decimal subdivisions, then use one New Course Request form for the generic information that will apply to all subdivisions; and use separate forms for each new decimal subdivision, including on each form the information that is unique to that subdivision. If the course offered is less than a quarter or a term, please complete the Flexibly Scheduled/Off Campus/Workshop Request form.

Description (*not to exceed 25 words*): Course will present information on important environmental and social

issues associated with pollutants. Also intended for high school teachers.

Quarter offered: Spring + Summer Distribution of class time/contact hours: 2 – 2 hr cl, 1 – 1 hr discussion

Quarter and contact/class time hours information should be omitted from Book 3 publication (yes or no):

Prerequisite(s): none

Exclusion or limiting clause: at least for 3<sup>rd</sup> and 4<sup>th</sup> year undergraduates

Repeatable to a maximum of \_\_\_\_ credit hours.

Cross-listed with: None

Grade Option (Please check): Letter X S/U  Progress  What course is last in the series? \_\_\_\_

Honors Statement: Yes  No X

GEC: Yes  No

Admission Condition

Off-Campus: Yes  No X

EM: Yes  No

Course: Yes  No

Other General Course Information:

(e.g. "Taught in English." "Credit does not count toward BSBA degree.")

**B. General Information**

Subject Code B Subsidy Level (V, G, T, B, M, D, or P) \_\_\_\_\_

If you have questions, please email Jed Dickhaut at [dickhaut.1@osu.edu](mailto:dickhaut.1@osu.edu).

1. Provide the rationale for proposing this course:

Provide students (in spring) and high school teachers (in summer) with an overview of environmental

Pollutants and their impact

2. Please list Majors/Minors affected by the creation of this new course. Attach revisions of all affected programs.

This course is (check one):  Required on major(s)/minor(s)  A choice on major(s)/minors(s)

An elective within major(s)/minor(s)  A general elective:

3. Indicate the nature of the program adjustments, new funding, and/or withdrawals that make possible the implementation of this new course.  
 This course will involved lectures presented electronically to students in various locations. Department chair is Supportive of this approach for this course.

4. Is the approval of this request contingent upon the approval of other course requests or curricular requests?

Yes  No  List:

5. If this course is part of a sequence, list the number of the other course(s) in the sequence: \_\_\_\_\_

6. Expected section size: \_\_\_\_\_ Proposed number of sections per year: \_\_\_\_\_

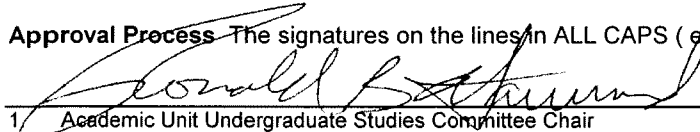
7. Do you want prerequisites enforced electronically (see OAA manual for what can be enforced)? Yes  No

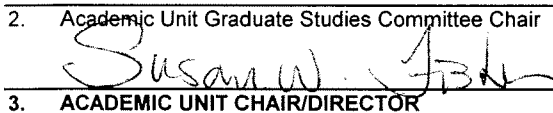
8. This course has been discussed with and has the concurrence of the following academic units needing this course or with academic units having directly related interests (*List units and attach letters and/or forms*):

Not Applicable

9. Attach a course syllabus that includes a topical outline of the course, student learning outcomes and/or course objectives, off-campus field experience, methods of evaluation, and other items as stated in the OAA curriculum manual and e-mail to [asccurrofc@osu.edu](mailto:asccurrofc@osu.edu).

**Approval Process** The signatures on the lines in ALL CAPS (e.g. ACADEMIC UNIT) are required.

1.  Ronald B Hammond 10/18/06  
 Academic Unit Undergraduate Studies Committee Chair Printed Name Date

2.  Susan W. Fisher 10/26/06  
 Academic Unit Graduate Studies Committee Chair Printed Name Date

3. ACADEMIC UNIT CHAIR/DIRECTOR Printed Name Date

4. After the Academic Unit Chair/Director signs the request, forward the form to the ASC Curriculum Office, 105 Brown Hall, 190 West 17<sup>th</sup> Ave. or fax it to 688-5678. Attach the syllabus and any supporting documentation in an e-mail to [asccurrofc@osu.edu](mailto:asccurrofc@osu.edu). The ASC Curriculum Office will forward the request to the appropriate committee.

5. COLLEGE CURRICULUM COMMITTEE Printed Name Date

6. ARTS AND SCIENCES EXECUTIVE DEAN Printed Name Date

7. Graduate School (if appropriate) Printed Name Date

8. University Honors Center (if appropriate) Printed Name Date

9. Office of International Education (if appropriate) Printed Name Date

10. ACADEMIC AFFAIRS Printed Name Date

## ENTOMOLOGY 597

### “ENVIRONMENTAL, HUMAN AND SOCIAL IMPACTS OF CHEMICAL AND BIOLOGICAL POLLUTANTS”

(5 credit hours)

#### Class Outline

**Clive Edwards & Joe Kovach (and guest speakers)**

**Eligible students: Undergraduates in Arts and Sciences**

#### Introduction

This course, in the College of Biological Sciences Curriculum, will be presented electronically and is targeted at 3<sup>rd</sup> and 4<sup>th</sup> year undergraduates in Arts and Sciences as a capstone course and also at high school teachers interested in acquiring information on important environmental and social issues associated with pollutants.

It will be presented annually from 2007 on in Spring and Summer Quarters with two 2-hour lectures and one 1-hour Discussion period per week. It will also be presented in a 3-week summer session in 15 days with 3.3 lecture hours per day for 3 weeks of 5 days (or alternatively 2.5 lecture hours per day for 4 weeks or 5 lecture hours a day for 2 weeks—to be decided based on Curriculum Committee recommendations and advice from the OSU Technology Enhanced Learning and Research Group).

- It will include:
- Attending lectures electronically
  - Reading selected reports, documents, and articles which will be provided electronically
  - Participation in the group Discussion sessions
  - Writing a report on a personally-selected chemical or biological pollutant-related topic

#### Course aims:

- For students to become aware of the many serious long-term pollution issues in modern society
- For students to understand how chemical and biological pollutants can impact all aspects of human daily health, life and welfare
- To discuss the human and economic costs of environmental pollution and the various ways in which they can be remedied, or lessened ecologically, by human responses, regulations, and by international cooperation

## Course Grading

The grade awarded will be based on two written examinations, a written report and discussion participation. In all of these the main emphasis will be on evidence of thinking around a topic, rather than giving set answers to questions.

<u>Item</u>	<u>Points</u>
Mid-term examination	30
Final examination	30
Written report grading	20
Group Discussion grading	<u>20</u>
Total	100

The grades will be assigned according to these scores.

A	=	94-100
A-	=	90-93
B+	=	87-89
B	=	83-86
B-	=	80-82
C+	=	77-79
C	=	73-76
C-	=	70-72
D+	=	67-69
D	=	60-66
E	=	0-59

## Course Overview

Each 2-hour lecture will involve the distribution of reading materials, and lecture presentations followed by questions. Each week a one-hour lecture session will be devoted to group discussions.

### **1. Introductory Lecture**

- Introductory quiz (to assess student needs)
- Nature of science
- Introduction to long-term pollution issues
- Impacts of pollutants on human health and reproduction
- Impacts of pollutants on human welfare
- Societal and ethical issues associated with pollutants

## 2. Types of chemical pollutants

### a) Industrial pollutants

- Chemicals (asbestos, formaldehyde, etc.)
- Chemical wastes (PCBs, heavy metals, etc.)
- Industrial emissions
  - NO & NO<sub>x</sub>
  - SO<sub>x</sub> & H<sub>2</sub>SO<sub>4</sub>
  - Particulates (smog)

## 3. Types of chemical pollutants

### b) Agricultural chemicals

- Pesticides
  - Insecticides
  - Fungicides
  - Herbicides
  - Nematicides
  - Molluscicides
- Fertilizers
  - Inorganic
  - Organic

### c) Energy based pollutants

- oil emissions
- nuclear wastes

## 4. Types of biological pollutants

- ### a) Human pathogens
- Smallpox
  - Black Death
  - AIDS
  - Bird flu
  - Ebola
  - Typhus
  - Anthrax
  - Bacterial diseases

## 5. Types of biological pollutants

- ### b) Genetically-modified organisms as pollutants
- DNA technology
  - GMO plants
  - GMO animals
  - Potential environmental hazards

## 6. Types of biological pollutants

### c) Organic wastes

- industrial
- waste water
- animal wastes
- air pollutants
  - NO<sub>x</sub>, SO<sub>x</sub>, CO, CO<sub>2</sub>

### d) Movements of organisms between countries and regions

- Insect pests
  - Mediterranean fruit fly
  - Colorado beetle to Europe
  - Japanese beetle to U.S.A.
  - Harmonia* (Asian coccinellid) to U.S.A.
  - Ash borer across U.S.A.
- Weeds
  - Forb-*Centuerea*
  - Purple loosestrife
  - Giant Ragweed
  - Japanese knotweed in Europe
- Plant pathogens
  - Phytophthora* from Australia to USA
  - Soybean rust from S. America
- Aquatic organisms
  - Zebra mussels
  - Asian carp
  - Lake Erie
  - U.S. rivers

## 7. Ecological impacts of chemical pollutants on terrestrial ecosystems

- Loss of soils
- Loss of plants
- Loss of animals (endangered species)
- Effects on soil dynamic processes
- Effects of crop production
- Contamination of food
- Uptake into organisms

## 8. Ecological impacts of biological pollutants on terrestrial ecosystems

- Bacterial contamination of ground water
- Changes in soil processes
- Contamination of crops
- Introduction of new pests
  - weeds
  - insects
  - plant pathogens

- Potential of GMOs to create new pest and disease problems
- Introduction of animal and human diseases to new areas

### **9. Effects of chemical pollutants on aquatic ecosystems**

- Mortality of plankton
- Mortality of fish
- Mortality of aquatic plants
- Uptake into human food
  - crustaceans
  - fish
- Movement into aquatic birds
- Persistence in sediments

### **10. Mid-term examination**

### **11. Effects of biological pollutants on aquatic ecosystems**

- Eutrophication
- Effects on crustacean and fish
- Uptake into human food
  - crustacea
  - fish
- Introduction of exotic predatory fish to new regions
- Introduction of aquatic pests e.g. Zebra mussels to Great Lakes
- Changes in trophic balances
- Changes in aquatic dynamic processes

### **12. Impacts of chemical pollutants on human health**

- Effects of toxic heavy metal
  - Cadmium
  - Lead
  - Zinc
  - Copper
  - Mercury
- Toxic effects of nitrates
- Toxic effects of pesticides
  - Food
  - Water
  - To application
- Pesticides acting as carcinogens
- Uptake of chemicals into body tissues
- Respiration illnesses -smog



### **13. Effects of biological pollutants on human health**

- Introduction of human pathogens to new regions
- Effects on reproduction
- Respiratory illnesses
  - pollen
  - asthma mites
- Effects of harmful bacteria
  - E. coli*
  - Salmonella sp*
- Effects on children

### **14. Assessment of risks associated with chemical & biological pollutants**

- Environmental risks and damage
- Human risks and health
- Losses of plants and animals
- Development of toxicity data on range of organism
- Calculations of exposure
- Identification of biological & chemical indices of risk
- Calculations of economic costs of risks
- Possible effects on global climate change

### **15. Economic costs of regulation of chemical pollutants**

- Costs of reductions in industrial pollutants
- Changing to organic food production--effects on prices
- Value of endangered species lost to pollutants
- Losses in food production by elimination of dangerous pesticides
- Effects of pesticide restrictions on food prices
- Costs of governmental regulatory services
- Loss of agricultural productivity
- Industrial constraints
  - chemicals
  - emissions
  - medical costs

### **16. Economic costs of regulation of biological pollutants**

- Costs of regulatory activities
- Restrictions on GMO activities e.g. cloning
- Costs of intergovernmental collaboration
- Restrictions on international trade
- Costs of disposal of organic wastes
- Constraints on biotechnology developments

## **17. Societal and ethical issues associated with chemical and biological pollutants**

- Constraints on national and international travel-e.g., cars and airplanes
- Constraints on imports
- Safe food supplies
- Costs of organic foods
- Religious issues—diet, etc.
- Preservation of safe recreation areas
- Maintenance of clean water supplies
- Human and animal genome issues, e.g. cloning

## **18. Case studies of chemical pollutants**

- Ecological and human effects of organochlorine pesticides
- Climate change
- Acid rain
- Heavy metals
- Nuclear wastes
- Asbestos

## **19. Case studies of biological pollutants**

- Harmonia*--Asian coccinellid beetle
- Zebra mussels
- Asian carp
- GMO plants
- AIDS
- Bird flu

## **20. Final examination**