



# Arctic Contaminant Modeling

## CHEM695 (3 credits)

Spring 2009

Application of computer models to understanding the distribution and transport mechanisms of pollutants in the Arctic. Topics include modeling the fate and transport of persistent organic pollutants, mercury, and oil spills in a multimedia Arctic environment. **prerequisite: CHEM 631 / ATM 631**

### Contact Information: Todd Guin

*office:* Reichardt 192  
*telephone:* 907 474-1966  
*email:* fftg@uaf.edu

Office hours:

### Course objectives:

The purpose of this course is to provide students with a fundamental understanding of modeling concepts as they apply to environmental systems in the Arctic. Areas of interest are the environmental fate and transport of persistent organic pollutants and mercury in both abiotic and biotic systems.

### Course overview:

This is a graduate level course that will provide students with an advanced understanding of environmental fate modeling concepts. Contaminants that are introduced into the Arctic environment are subjected to various physical, chemical, and biological processes. These processes act in an interconnected way in the environment, to influence the overall fate of the compound. Ultimately, it is only through the use of models that we can begin to better understand these interactions.

The emphasis of this course is to provide an understanding of how molecular interactions and macroscopic transport phenomena determine the distribution in space and time of organic pollutants released into the natural environment. This will be achieved through a series of lectures, assignments, and a class project that will provide students with an understanding of how to develop and use multimedia models.

### Evaluation and grading

**Assignments:** 2 assignments at 10% each = 20%

**Term paper:** 25%

**Presentation:** 10%

**Model development:** 45%

Final grades will be based on the students earned percentage of the total possible points, using the University's plus/minus grading scale (90.0 – 100 = A; 87.0 – 89.9 = A-; 83.0 – 86.9 = B+; 80.0 – 82.9 = B; 77.0 – 79.9 = B-; 73.0 -76.9 = C+, and so on).

## Textbook

Integrated Environmental Modeling by Ramaswami et al. John Wiley & Sons, Inc.

## How the course works

### Lectures, Tutorials, & Assignments

Lectures:

- Tuesdays and Thursdays 1.5 hour time slot, in room \_\_\_\_.

## Course Policies

CHEM695 is governed by the academic regulations at UAF, found in the 2008-2009 Academic Calendar (pp. 78-84). Some additional policies are specific to CHEM695, and are listed below:

Assignments:

- Assignments are to be submitted by the assigned date during class time (lecture or lab), or before the assigned date via email. Please do not submit assignments under my office door.
- Your graded assignments will normally be returned the week following the assignment's due date.
- If you feel that any assignment has been incorrectly or unfairly graded, please put your argument in writing (Note: no written argument, no re-grade), attach it to the original assignment, and deliver it to me. I will then remark the *entire* assignment. The new mark, which could be either higher or lower than the original mark, will be your grade.
- If you are late on an assignment, **a penalty of 5% per day is applied up to 5 calendar days**, and after then it will not be marked. An extension may be granted under exceptional circumstances (e.g., medical condition, family emergency).
- I encourage you to make use of the Writing Center (8th floor, Gruening Building) where you can take a draft of any writing for assistance. I will require you to submit a draft of your project, which will be graded, and I will provide feedback. Thus, the more substantial your draft, the more substantial the feedback.

Referencing your work & plagiarism:

- Where applicable, you are expected to provide references for all of your assignments. References serve three purposes: (1) to credit others for their ideas; (2) to demonstrate your understanding of the literature; and (3) to allow the reader to refer to the original reference for further detail or interpretation. Detailed references should follow the citation conventions of one of the following: Nature, Environmental Science & Technology.

Plagiarism is an extremely serious academic offense as outlined in the University Calendar and carries penalties varying from failure in an assignment to suspension from the University. Plagiarism is defined as appropriating passages or ideas from another person's work and using them as one's own. Lifting passages of text from the Web is also plagiarism and will not be accepted.

**Students with documented disabilities:**

Students with a physical or learning disability, who may need academic accommodations, should contact the Disability Services office (203 WHIT, 474-7043). Disability Services will then notify the instructor of special arrangements for course work.

**Computer Lab:**

Your enrollment in CHEM631 gives you user privileges in the department's computer lab. Information and policies are available at [www.uaf.edu/chem/NewNetwork.html](http://www.uaf.edu/chem/NewNetwork.html).

### Tentative Course Schedule & Readings

Dates	Topic	Reading	Activity
Week 1	A review of multimedia models	Chapter 1	
Week 2	Review of physical-chemical properties of organic contaminants	Chapter 2	
Week 3	Review of equilibrium intermedia contaminant transfer	Chapter 3	
Week 4	Kinetics of Intermedia transport	Chapter 4	
Week 5	Transport fundamentals	Chapter 5	
Week 6	Exposure and risk assessment	Chapter 13	
Week 7	Tools for evaluation, analysis and optimization of environmental models	Chapter 14	
Week 8	Case studies of models in the Arctic: Abiotic transport	Wania and Mackay article	
Week 9	Case studies of models in the Arctic: Biotic transport	Czub and McLaughlin article	
Week 10	Building models in Excel		
Week 11	Other modeling languages		
Week 12	Presentations		