Term: Fall 06

CE 423/523. Effects and Fates of Hazardous Chemicals Released to the Environment (Monday, Wednesday, and Thursday; 6 to 6:50 PM; 215 AIME)

Instructor: Robert Pitt

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Catalog Description
Chemical fate and transport in the environment. Frequency and magnitude of accidents involving hazardous materials. Effects of these releases on the community.

Prerequisites
Prerequisite by topic and typical classes:
1. basic chemistry (Chemistry 131 and 132)
2. fundamental math (Math 126)
3. basic environmental engineering (CE 420)
4. water resources (CE 478)
5. air resources (CE 425)

or permission of instructor

Co-requisites
None

Course Objectives
At the successful completion of this course, the student will be able to integrate chemical property information to better understand the transport and fate of hazardous chemicals released to the environment. The student will also be able to examine case studies to understand the long-term social and environmental effects of these releases.

Course Website
http://unix.eng.ua.edu/~rpitt/Class/Classes.shtml
The course website includes copies of most of the presentation material, along with selected additional readings. Students are expected to have reviewed this material, and read the relevant book chapter before the class lectures.

Required Texts and References
**Suggested Texts and References**


**Course Topics**

Course topics and approx. length of class time for topic:

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Students are expected to review the course material before the lectures.

**Additional Course Information:**

Accidents involving chemicals or radioactive materials represent a significant threat to the environment, public health and safety, and community well-being. In an increasingly complex and interconnected world, no community is immune from the threat posed by environmental accidents and contamination. Even communities far removed from industrial production or storage facilities can still be at risk from accidents associated with the transport of hazardous materials. While a variety of studies have been conducted on aspects of major transportation accidents, few have attempted to examine both environmental and community aspects of the problem. In contrast, this course takes an integrated approach to hazardous transportation accidents by considering environmental, safety, economic, and psychosocial issues.

The course will cover basic environmental chemistry topics and will conclude with practical applications covering an analysis of transportation-related accidents involving hazardous materials and likely important social, psychological and related community impacts that can occur after transportation-related hazardous materials accidents.

Several case studies will be examined of actual accidents, ranging from small to very large releases of hazardous materials and will illustrate the varied long-term problems that have resulted. In addition, detailed quantitative procedures will be studied covering problems associated with spills of petroleum hydrocarbons (the most common material involved in transportation accidents) and losses of ammonia (a toxic gas).
Grading

There will be about four sets of problems assigned from the text, plus the midterm report and presentation, and the final presentation and report. Each of the problem sets and presentations will be worth about 10% of the final grade, the midterm report will be about 15% and the final report will be about 25%. Missing problem sets will be assigned a zero. Graduate students will be graded separately from the undergraduate students, and will be expected to produce superior work. In addition, graduate students will be periodically called upon to discuss aspects of their research that is relevant to the class, during times when the instructor is traveling. Work done correctly and completely will receive an above average grade. Excellent work, going beyond the minimum stated assignment, will receive a superior grade.

Attendance Policy

Students are expected to attend all lectures. In an absence is unavoidable, the student should contact the instructor before the class meets, and meet with other students to review missed material. Excessive unexcused absences may result in grade reductions.

Homework Policy

Late assignments may be accepted, but will suffer a grade penalty. If more than one homework assignment is missed, the student will receive an incomplete for the class.

Exam/Quiz Policy

All presentations and reports (the midterm and final assignments) must be completed. If an emergency occurs, the student must let the instructor know, if possible, to reschedule any missed presentations.

Policy on Missed or Late Coursework

If more than one problem set is missing, or any of the other class material is not turned in, the student will receive an incomplete for the course.

Academic Misconduct

Any act of dishonesty in any work constitutes academic misconduct. The Academic Misconduct Disciplinary Policy will be followed in the event of academic misconduct and will be handled by the Dean’s office.

Accommodations

Reasonable accommodations are made on an individualized basis. It is the responsibility of persons with disabilities, however, to seek available assistance and make their needs known. The University has designated the Office of Disability Services as the campus coordinating office for the provision and delivery of services and reasonable accommodations that ensure the University’s programs, services, and activities are accessible to students with disabilities. The Office of Disability Services is available to assist any student who has a qualified and documented disability. Please contact the Office of Disability Services at 348-4285 for additional information.
Midterm Exam
Date(s)

There will be a mid-term paper due on October 18, 2006 (the actual date will be one week after we have completed the first four modules, through the atmospheric evaluation discussion). This paper will examine several hazardous material case studies: prepare preliminary evaluations for each of the accidents assigned (chemical, site, and evaluation information). These will include descriptions of the material involved in the accidents (summarize standard hazardous information and chemical characteristics for the chemicals involved), the amounts of material lost, the damage and effects caused, numbers of people involved, etc. In addition, you will calculate the resulting concentrations and exposure durations for the accidents. You need to determine the data requirements for complete evaluations for these accidents, and obtain as much of the needed data as possible, and note the missing information and how that might be obtained. You can do some preliminary calculations using the material we have covered in class, and by making typical assumptions. Your final exam will include a more detailed evaluation of one of the accidents, including long-term social problems associated with the incident. You should be able to do a pretty through search for accident, chemical, and site data, and understand your problems pretty well. I will want a concise report (say, 15 pages, max) plus a presentation that you will give to the class.

Final Exam
Date:

December 11, 2006; 7 – 9:30 pm. Final presentations and final reports due.

Other Important Dates:

Classes when I will be out of town include the following. Additional trips may occur during the term that have not yet been scheduled. It is anticipated that class projects, and possibly substitute lectures will be scheduled during these times. Students will be told of plans for these days:

- August 24 and 28 (EPA laboratory tests, PA and WV)
- September 7 (AWEA conference, Perdido Beach)
- September 18, 20, and 21 (research meetings, OK)
- October 11 and 12 (UNH conference)
- October 23 and 25 (WEFTEC, Dallas)
- October 30 (conference, Fishkill, NY)

UA Holidays (no classes)

September 4 Labor Day
October 19 Mid semester break
November 22 and 23 Thanksgiving holiday
Student Portfolio

The CCEE program requires every undergraduate student to develop a portfolio documenting their work towards their degree, specifically relating to the needed degree outcomes. The outcomes that are partially, or completely, addressed are listed at the end of this syllabus. The student portfolio will be comprised of examples from different courses that support the attainment of all of the needed outcomes. Several homework assignments and projects for this class address some of these outcomes, as listed below. If a student does well in these assignments, they would be suitable examples for inclusion in the degree portfolio.

Contribution to Program Student Outcomes

As required for the accreditation of our BSCE program, the Civil Engineering program at The University of Alabama, in full consultation with its various constituencies, including alumni and employers, has established the following overarching student outcomes. These outcomes describe what students are expected to know or be able to do at the time of graduation from our program. To progress towards these outcomes, each course contributes both directly and indirectly to the development of various skills, specific to the course subject matter, that support these outcomes. At a minimum, the outcomes that have been checked below will be fully or partially addressed specifically and in a significant manner in this course. Other outcomes may be addressed to a lesser extent.

- **Outcome T1: (Level 3)** Solve problems in mathematics through differential equations, probability and statistics, calculus-based physics, and general chemistry. (*Predictions and Modeling of Fate and Transport*)
- **Outcome T3: (Level 3)** Apply relevant knowledge, techniques, skills, and modern engineering tools to identify, formulate, and solve engineering problems, including problems in at least four technical areas appropriate to civil engineering (*Environmental*).
- **Outcome T5: (Level 3)** Determine possible global, economic, environmental, and societal impacts of a specific, relatively constrained engineering solution. (*Transportation of Hazardous Materials*)
- **Outcome T7: (Level 1)** Define key aspects of at least one traditional or emerging area of advanced specialization within the context of civil engineering (*Environmental Chemistry and Fate and Transport; Homeland Security*).
- **Outcome P1: (Level 4)** Analyze a complex situation involving multiple conflicting professional and ethical interests, to determine an appropriate course of action. (*Social Impacts of Accidents*)
- **Outcome P2: (Level 4)** Organize and deliver effective written, verbal, graphical and virtual communications. (*midterm and final presentations and reports*)
- **Outcome P4: (Level 3)** Demonstrate the ability to incorporate specific contemporary issues into the identification, formulation, and solution of a specific engineering problem. (*Homeland Security and Environmental Disasters*)