CEE 3104 INTRODUCTION TO ENVIRONMENTAL ENGINEERING

Class Location: Surge 118B Class Time: 11:15-12:05 MWF Instructor: **Peter Vikesland (415 Durham Hall)** Office Hours: **Monday 1:30-2:30 pm** **Friday 1:00-2:00 pm** **Other times by appointment** Phone: **231-3568** e-mail: **pvikes@vt.edu**	TA: **Dane-Marie Greaves** Office hours: **Thursday 2:00-4:30** Location: 206 Femoyer e-mail : gdanem5@vt.edu

1. GENERAL COURSE INFORMATION

Objectives. The course will examine key concepts in water pollution, air pollution, hazardous wastes, environmental legislation, and global atmospheric change. This broad survey will aid your understanding of the interesting and complex environmental topics that are regularly "in the news". The course is valuable as a prerequisite to more advanced courses in environmental engineering, as a technical education for the general citizen and interested students outside of engineering, and as an introduction to environmental constraints that are increasingly important to all engineering disciplines.

Prerequisites. A grade of C- or better in CHEM 1035, 1045; MATH 1205, 1206; and PHYS 2305.

Text. The required textbook is Masters, G.M. and Ela, W.P. *Introduction to Environmental Engineering and Science*, Third edition, Prentice Hall, 2008. Additional readings will be posted on Scholar.

Lecture Materials. Supplemental material for each of the lectures will be posted on Scholar. You should download and print this material before coming to class, as this will aid your understanding of the material presented in class. Alternately, you are free to follow along using a laptop or tablet PC.

2. DESCRIPTION OF COURSEWORK

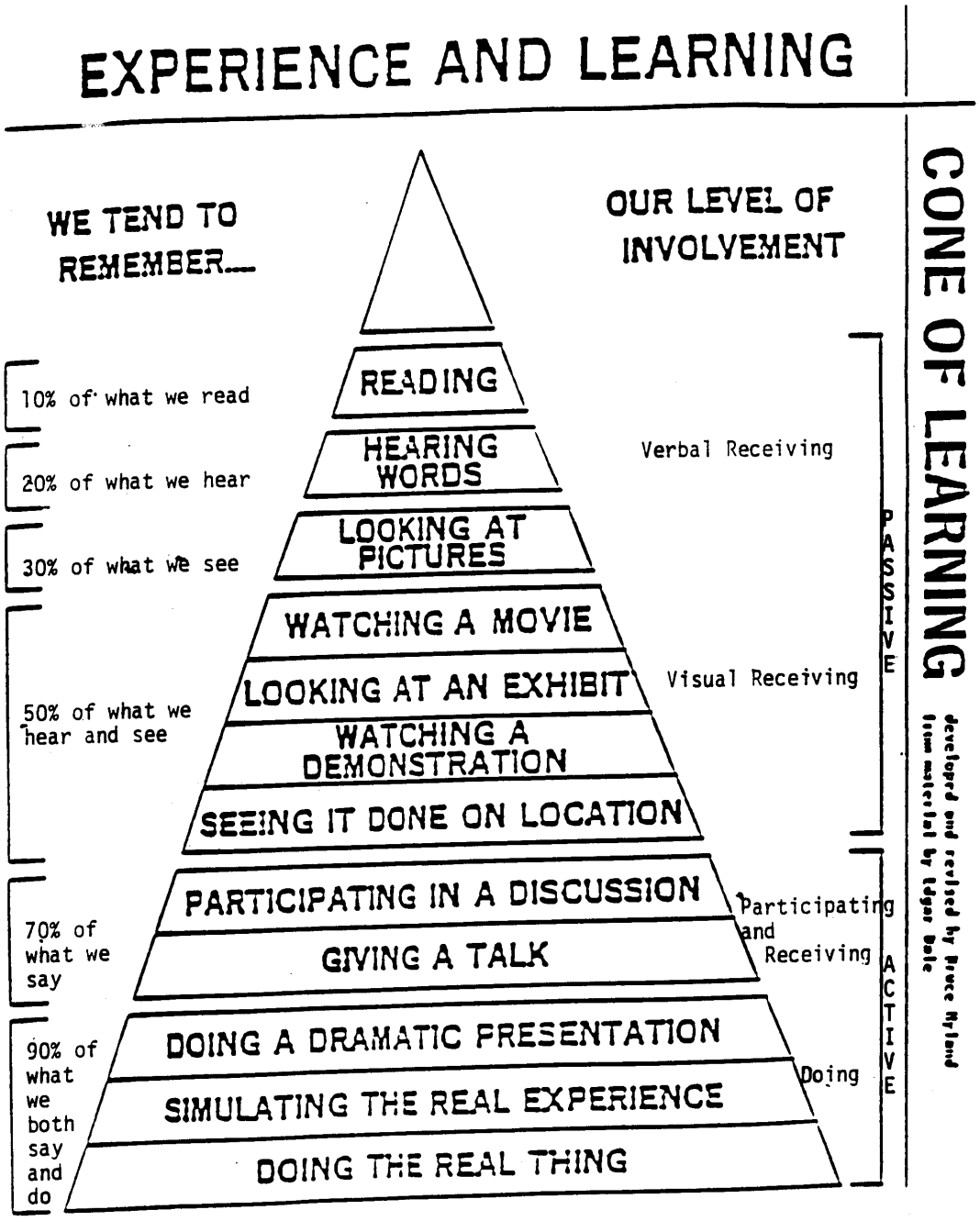
The coursework is designed to help you master the material at a number of levels on the "cone of learning" (next page). Reading assignments, in-class activities, and lectures allow you to develop a basic understanding of the material. Homework assignments and exams provide you with an opportunity to synthesize and understand the material at a deeper level.

Readings. The readings are an essential first step in the learning process. Each reading assignment should require about 1-3 hours and should be completed before class. For each reading assignment you should force yourself to take one to two pages of notes on definitions, simple examples and "big picture concepts".

Lecture and Homework. The class lecture is not a dictation session parroting the text. Rather, lectures are intended to clarify and augment material presented in the book. Lectures provide us an opportunity to work out problems similar to those on the homework.

Completed homework must be turned at the start of class on the indicated due date and late homework will not be accepted unless there are exceptional circumstances. If you will be absent from a class, either submit the homework early or make arrangements for a classmate to submit your homework on time.

Three exams are scheduled. These exams will cover the lecture and will consist of problems similar to homework problems. Prior to each exam you will be provided an equation sheet that notes the equations you will be provided with for a specific exam.



Approach and Help on Homeworks. Each of you should try to solve the problems independently at first (for at least 15 minutes/problem) and work until you cannot make additional progress. At this point it is your duty to seek out help, first from your classmates and then from either the TA or the instructor. Do so. We are here to help you. On the other hand, be prepared since our first question will always be "Where are you stuck?"

3. STANDARDS, ETHICS, GRADING, AND REGRADING

Homework Standards. Complete your homework on standard engineering paper or loose leaf paper. Leave adequate space between problems. Staple and number all pages. Use sketches for each problem if at all possible-- sketches should be sufficiently large to avoid crowding and should be carefully drawn. In solving problems, clearly indicate notation, units, and sign convention. Steps in the solution should be arranged in a logical sequence. Indicate the principle used and write out equations prior to insertion of the data. To minimize error and facilitate checking, record all necessary calculations, indicate multiplication and division clearly and make decimal points distinct. When appropriate, write using complete sentences that are grammatically correct. Put your name on each page and note the assignment number clearly.

Homework will be graded on logic and approach (2/3 of grade) and the accuracy of your answer (1/3 of grade). Your grade on the homework will reflect how well you comply with the above standards.

Class Ethics. The Virginia Tech honor code will be strictly enforced in this class. To help eliminate any possible gray areas, please note that the following are considered unethical:

1) ***To have the appearance of trying to obtain information from any source other than your own personal notes during closed book in-class exams.***
2) ***Allowing a classmate to copy your homework or asking a classmate to allow you to copy their homework.*** Working together and verbally exchanging ideas on problem solving approaches is encouraged; in fact, bonus points can be earned if your ability to help classmates is exceptional. On homework, checking of answers is part of the learning process and is encouraged. Appropriate help does not extend to giving your classmate completed problems for them to examine or copy, nor should you ask this of others. Common spreadsheets are not acceptable.
3) ***Plagiarizing.*** Do not use ideas from other sources without references.
4) Failure to uphold other accepted standards of ethical behavior.

Grading. As our ultimate goal is to help everyone learn the material and to earn an "A", there is no curve in this class. Forty-five percent of your grade will be based on your exam scores, and the remaining fifty-five percent will be based on your homework, your attendance for the in-class exercises, and your in-class short quizzes. The grade scale is defined as follows: A = 100-94; ;A- = 93-90; B+ = 89-87; B = 86-83; B- = 82-80; C+ = 79-77; C = 76-73; C- = 72-70; D+ = 69-67; D = 66-63; D- = 62-60; F = <59.

	#/semester	*Individual Weight*	*% Overall*
In-class exercises*			***20***
Homework			***25***
Mid-Term Exams	***2***	***12.5***	***25***
Quizzes	***5***	***2***	***10***
Final Comprehensive Exam	***1***	***20***	***20***
Total			***100***

*Will occur throughout the semester. May involve small group activities, problem-solving, etc…

Regrading. We consider your grade to be extremely important and strongly encourage you to bring substantial errors (> 3%) in grading to the TA's attention. However, only written requests for regrading will be considered. Your written request must be brief, to the point and accompanied by the original unaltered work under contention. In the unlikely event that you are not satisfied through this process, bring the written request to my attention during office hours or by email.

IMPORTANT NOTE: This course is a prerequisite for one or more CEE courses. As of Fall 2006 the CEE department has established a policy that students must earn a grade of C- or better in all prerequisite courses to other CEE courses. If you intend to take any courses that CEE 3104 is a pre-requisite for, you must earn a grade of C- or better in this course.

4. BONUS POINTS

A "bonus" policy has been instituted that rewards working together when you study. Bonus points are added directly to your final class average. In the past bonus points have produced substantial letter grade improvements (i.e., changing a "C" to a "B") for exceptional students.

Helping Others Learn. Helping others learn and succeed is another important skill that will be important to your future success. To foster class cooperation outside the classroom and to provide a reward for motivating and assisting your classmates, a bonus grade will be given based entirely on peer evaluation. During each of the three in-class exams you will be asked to name (confidentially) the classmate that contributed the most to your success in this class. You may not name yourself. For each time that you are named by your peers you will

receive 1/3 bonus point that is directly added to your final semester numerical grade. **Up to 1 point can be obtained via this mechanism.**

5. STUDENTS WITH SPECIAL NEEDS

If you need adaptations or accommodations because of a disability (e.g., learning, attention deficit disorder, psychological, physical, etc.), if you have emergency medical information to share with me, or if you need special arrangements in case the building must be evacuated, please make an appointment to meet with me during the first two weeks of the semester.

6. COURSE OBJECTIVES

The following are the primary objectives for this course:

1. Recognize the major regulations used to protect air and water quality.
2. Evaluate the fate of contaminants (Examples: BOD, chlorinated solvents, etc…) in natural and engineered environments using mass balances.
3. Utilize simple models (Batch, PFR, CMFR) to describe contaminant fate.
4. Describe appropriate strategies/technologies to produce high quality drinking water.
5. Recommend appropriate strategies/technologies to produce high quality wastewater treatment plant effluents.
6. Relate drinking water and airborne contaminant standards to the protection of health using risk assessment protocols.
7. Describe the indoor, local, regional, and global impacts of air pollution.

Schedule (Subject to change)

MODULE I – Global climate change/Air Quality/Sustainability

Week of	Topic	Reading*
August 27	Introduction to class/syllabus/sustainability *PCBs in the Last Frontier* – case study (8/31)	Sustainability reading, 36-40, 88-89, 102-106
September 3	Definition of units Organic Chemistry	2-6, 70-76, 501-530
September 10	Global climate change. In-class activity 9/14 (Energy Balances, CO_2)	536-551, 566-568
September 17	Global climate change (Implications/Solutions) Ozone Hole	574-587
September 24	Air quality (Acid Rain, Reaction Stoichiometry)	48-52, 57-67, 367-399
October 1	Air quality (Gaussian Plume) **Exam 1 (October 5)** – Global climate change, organic chemistry	451-466
October 8	Air quality (Indoor Air, Mass Balances)	6-21, 470-486
October 15	Reaction Kinetics and Reactor Models	89-101, 120-129, 467-470
MODULE II – Environmental contamination at Woburn, MA		
October 22	Risk assessment *Risk assessment* – case study	127-166
October 29	Groundwater	229-244, 255-266, 67-70
November 5	Carbonate chemistry Surface water assessment **Exam 2 (November 7) –** Air quality, reactor models, risk, carbonate chemistry, groundwater	173-219
November 12	Surface water	
MODULE III – Engineered solutions for water quality maintenance		
November 26	Wastewater treatment	281-283, 316-333
December 3	Wastewater/Drinking water treatment	284-303
December 10	Drinking water treatment	
December 17	**Final Exam (Focusing on Modules II and III) – 3:25-5:25 p.m.**	

*These reading assignments are subject to change. You will be informed if the assigned pages vary.