ENVE 615
ENVIRONMENTAL CHEMISTRY
FALL, 2008

INSTRUCTOR: Dr. Richard F. McCormick **DAY/TIME:** 6:30 – 9:00 Thursday

CLASS LOCATION: GH 121 (WEL 101*) * (after September 4th or so)

OFFICE: GH 3G (WEL 111*) **PHONE:** 696-6049 **EMAIL:** mccormickr@marshall.edu

OFFICE HOURS: 9 – 10 MWF, 11 – 12 MWF; other hours as posted or by appointment

TEXT: *Chemistry for Environmental Engineering and Science*, Sawyer, McCarty, & Parkin, 5th Edition, McGraw-Hill, 2003.

COURSE OBJECTIVE: To continue the education of the environmental engineering/science student in the area of environmental chemistry including laboratory techniques.

COURSE OUTCOMES: With the successful completion of the course, the student should be able to:

1. Understand the use of the terms *turbidity, color, pH, acidity, alkalinity, hardness, dissolved oxygen, BOD, COD, nitrogen, iron, manganese, solids, sulfates, and phosphates* as they apply to the field of environmental engineering.
2. Understand the use of principles of stoichiometry, ionization, and bonding.
3. Understand the use of principles of oxidation and reduction in environmental engineering relationships.
4. Understand the principles of acid/base reactions, buffers, and solubility product.
5. Be familiar with the principles of chemical thermodynamics, electrochemistry, and chemical kinetics in environmental applications.
6. Understand chlorine chemistry as it applies to disinfection.

GRADING BASIS:	2 Hourly Exams	@	20% each	40%
	Homework			20%
	Lab			20%
	Final exam			20%
	Total			100%

The lab grade will consist of	Weekly exercises/reports	60%
	Lab mid-term exam	20%
	Lab final exam	20%
	Total	100%

TEST SCHEDULE:	Hourly Exam #1	October 2, 2008
	Hourly Exam #2	November 6, 2008
	Final exam	December 11, 2008
	Lab mid-term exam	November 6, 2008
	Lab final exam	December 11, 2008

NOTE: Because this course meets only one night per week, an entire period cannot be devoted to just one hourly exam. For the first test, therefore, we will have a lecture preceding the test, and for the second hourly exam and the final, we also will have lab tests in addition to the course tests.

NOTE: A lab schedule, with safety instructions, will be distributed next week.

For the last several years, this course has been taught in South Charleston with lab facilities being leased in Dow Building 701. That lease with Dow terminated in 2007, and Marshall then began construction on the new Weisburg Engineering Lab building. This facility was dedicated on August 16, 2008 and should be operational within the next two weeks. Until then, the class will meet in Gullickson Hall Room 121, and our lab work will not begin until we can move into the new building.

COURSE TOPICS:

1. Basic chemical definitions, stoichiometry, and ionization
2. Periodic table and bonding
3. Turbidity, color, and pH
4. Acidity and alkalinity
5. Hardness and dissolved oxygen
6. BOD and COD
7. Nitrogen, iron, and manganese
8. Solids
9. Sulfates and phosphates
10. Oxidation/reduction reactions
11. Law of mass action
12. Acids and bases
13. Buffers
14. Solubility product
15. Chemical thermodynamics
16. Electrochemistry
17. Chemical kinetics
18. Chlorine chemistry and disinfection

INITIAL HOMEWORK ASSIGNMENTS:

#	Assignment/Problems	Due Date
1	**Work Stoichiometry Handout**	**September 4**
2	**Read Chapters 13 – 16** **Work problems 13-2, 13-3, 14-1, 14-3, 15-1, 16-3**	**September 11**
3	**Read Chapters 17 – 19** **Work problems 17-7, 17-11, 18-10, 18-11, 19-8**	**September 18**
4	**Read Chapters 22 – 24** **Work problems 22-1, 22-7, 22-9, 23-2, 23-3, 24-1, 24-2**	**September 25**
5	**Read Chapters 25 – 27** **Work problems 25-1, 25-4, 26-2, 27-1, 27-3**	**October 2**
6	**Read Chapters 29 - 30** **Work problems 29-1, 29-6, 29-8, 30-2, 30-3, 30-5**	**October 9**

Instructions for Lab/Reports

1. Final lab reports will be due at the beginning of the next lab period or when otherwise stated by the lab instructor. There are two types of lab reports: formal and informal. **Informal** lab reports must be done neatly on 8 1/2 by 11 engineering grid paper or on typing paper. They will consist of one page containing the data recorded during the experiment and any calculated results appropriate for the given experiment. To accompany this page will be the answers to several questions attached to the lab handout material. Each data sheet will be worth 40 points, and each question will be worth 10 points. A **formal** lab report will be typewritten, will contain a purpose, discussion of theory, procedure, sample calculations, results, discussion of results, conclusions, and finally, an appendix containing the raw experimental data. Formal lab reports will be graded on the basis of the quality of the experimental results (raw data, calculations, and interpretation of results), report content and organization, spelling, grammar, neatness, and other pertinent factors. Each report should have a cover sheet giving the class number and name, experiment name and date, and the student's name and signature. Formal lab reports will be worth 100 points each. For both formal and informal lab reports, when possible, data should be analyzed statistically. At the very least, the mean of the data along with the standard deviation should be calculated. Final lab reports will ***not*** be accepted late.

2. Instructions will be given with each lab performed whether the report is to be formal or informal. If no instructions are given specifically, it will be understood that the lab report is to be informal.

3. At the end of each lab, waste material will ***not*** be poured down the drain. All waste liquids, including excess titrants, will be placed in the designated disposal container.

ENVE 615
Environmental Chemistry
Tentative Lecture/Lab schedule
Fall, 2008

Date	Lecture/Lab #	Topic	Turn in
8/28	**Introduction** **Lecture #8**	 **Basic chemical fundamentals**	
9/4	**Lecture #9** **Lecture #1**	**Periodic table, chemical bonding** **Turbidity, color, pH**	**HW #1**
9/11	**Lecture #2** **Lecture #3** ***Lab #1***	**Acidity, alkalinity** **Hardness, dissolved oxygen** ***Standards***	**HW #2**
9/18	**Lecture #4** **Lecture #5** ***Lab #2***	**BOD, COD** **Nitrogen, iron, manganese** ***Acidity/Alkalinity***	**HW #3** ***Lab Report #1***
9/25	**Lecture #6** **Lecture #7** ***Lab #3***	**Solids** **Sulfates, Phosphates** ***Turbidity/Color***	**HW #4** ***Lab Report #2***
10/2	**Exam #1** **Lecture #10**	 **Oxidation, reduction**	**HW #5**
10/9	**Lecture #11** **Lecture #12** ***Lab #4***	**Redox, chemical equilibrium** **Acids, bases** ***Hardness/Solids***	**HW #6** ***Lab Report #3***
10/16	**Lecture #13** **Lecture #14** ***Lab #5***	**Buffers** **Solubility product** ***Residual Cl_2***	**HW #7** ***Lab Report #4***
10/23	**Lecture #15** **Lecture #16** ***Lab #6***	**Disinfection, chlorine chemistry** **Chemical thermodynamics** ***Dissolved Oxygen***	**HW #8** ***Lab Report #5***

10/30	**Lecture #17** **Lecture #18** ***Lab #7***	**Chemical thermodynamics** **Electrochemistry** ***Phosphates***	**HW #9** ***Lab Report #6***
11/6	**Exam #2** **Lab Mid-term**		
11/13	**Lecture #19** **Lecture #20** ***Lab #8***	**Chemical kinetics** **Colloid chemistry** ***Sulfates***	**HW #10** ***Lab Report #7***
11/20	**Lecture #21** ***Lab #9***	**Coagulation summary** ***Jar Test***	**HW #11** ***Lab Report #8***
12/4	**Review**		***Lab Report #9***

Note: These due dates are tentative and subject to change depending upon how we cover the material. However, they will stand unless changed by me in lecture.

2008 COURSE POLICIES

Dr. Richard F. McCormick, PE

GRADING BASIS: Grades will be based upon hourly exams, homework, and a comprehensive final examination. More specific information, including any exceptions, will be found on the handout sheet that pertains to each respective course.

Letter grades will be determined by a 10% differential scale (i.e. 90-100 = A, 80-89 = B, etc.) I reserve the right to make adjustments to the scale according to overall class performance; however, the scale cannot be raised, only lowered.

HOMEWORK: Homework will be assigned on a regular basis. To be on time, it must be turned in at the beginning of the class period when it is due. There will be a 10% late penalty for each day it is late--starting with a 10% penalty on the first day if it is not turned in at the beginning of class. After 10 days, it will not be accepted at all. (*EXCEPTION: No late homework will be accepted after the final day of classes for the semester!)*

MAKEUP EXAMS: Make-up exams will be given only to those students who can present a satisfactory excuse to explain the reason for their absence. Make-up exams will be scheduled at my convenience and will only be scheduled once.

CHEATING: Any student caught cheating will immediately fail the course. Cheating is defined to include copying from fellow students, helping another person on a test or quiz, being in the possession of material that would enable one to cheat, and having on your person or nearby any books, notes, papers, etc. that have not been approved by the instructor beforehand. Paper will be provided for hourly exams, so no student will be allowed to bring anything to a test except for pencils, timepiece, erasers, straightedge, and calculating instrument. **The storage of class information in programmable calculators is considered cheating.** Also, no one will be allowed to wear a cap or hat during exams.

ATTENDANCE POLICY: Unless made part of a specific course's requirements, attendance in my classes is not mandatory, although each student is strongly urged to attend each class meeting. All students are responsible for material covered in lecture and all assignments made during lecture.

GENERAL COURTESY:

1. All cell phones and pagers are to be turned off during class.
2. Food and drink are not to be brought into the new classroom in the Weisburg Engineering Lab building.

ANNOUNCEMENTS:

On Sunday, August 31st at 1:30 p. m. the Charleston Regatta is sponsoring an "Anything that floats" race. We have entered a raft for CITE. We need paddlers. If you are interested, contact Dr. Simonton at 552-7488 ASAP.