

CE475 – WATER QUALITY ANALYSIS
SPRING 2007

Lecture: 2:30 – 3:20 pm MW
 113 Sackett Building

Laboratory: 3:35 – 6:35 pm M (some W)
 124 Sackett Building

Instructor: Dr. Bill Burgos
 115 Sackett Building

Telephone: 863-0578
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Office hours: 9:00-10:00am TTh, 3:30-5:00pm W, other times by appointment

Assistant: Jennine Terrill, Graduate Teaching Assistant, 5-C Sackett Building, jbt134@psu.edu

Prerequisites: CE 370, CHEM 012, CHEM 014

Course Objectives: Apply principles of aquatic chemistry to understand basic quantitative analyses common in water and wastewater treatment. Prepare students for independent laboratory research. Improve students' technical writing skills.

Textbook: Chemistry For Environmental Engineering and Science 5th Ed. (2003) C.N. Sawyer, P.L. McCarty and G.F. Parkin, McGraw Hill (required)

Laboratory Manual: Available at Engineering Copy Center, 101 Engineering Unit A (required)

Course Web Page: The ANGEL course management system will be used to communicate with students, to post lecture material to post homework assignments (and solutions), and as a link to other relevant reference material.

Grading:	2 Examinations @ 100 pts each	200	40	93-100%	A
	2 Progress Reports @ 50 pts each	100	20	90-92%	A-
	Final Presentation	50	10	87-89%	B+
	2 Student Peer Evaluations @ 12.5 pts each	25	5	83-86%	B
	Lab Quizzes	50	10	80-82%	B-
	Homework Assignments	<u>75</u>	<u>15</u>	77-79%	C+
	Total	500	100%		

Examinations: Each exam will cover roughly one-half of the course. Exams will be 50-min, in-class, closed-book tests where students are allowed to bring one 8-1/2"×11" sheet of notes.

Progress Reports: Each lab group (four anticipated) will participate in our collective research project that involves both field work in collecting water samples from specified sampling locations, and lab activities in analyzing these samples for a number of specified parameters. The first eight laboratory exercises are designed to train students to perform all of these tasks independently. The following five lab periods are reserved for bringing your water samples into lab, and performing the requisite analyses. The first progress report will be due Wed 3/28/2007 and serve as the introduction, and materials and methods sections for the technical report describing your research project. The second progress report will be due Wed 4/18/2007 and also include (most of) the results, and discussion sections of your technical report. Additional information on these reports and specific format information will be provided during the semester.

Final Report and Presentation: Student groups will be required to submit a final written report and present an oral report to the class. The final presentations will require compiling not only your group's research results, but also the results from all the student groups for the different water sources tested. A complete analysis of all the data is required to fully evaluate the potential impact of the I-99 acid rock drainage (ARD) on Buffalo Run (description below). For the final oral presentation, our class results will be presented at a "public meeting" where representatives of local municipal governments, conservation groups, PennDOT, PADEP and local citizens will be invited to attend. We will collaborate to produce one presentation composed of four parts: background information; study design and methods; results; and, conclusions and recommendations. Each group will be responsible for presenting one of the parts and the assignment of the parts will be decided on by all groups. Each part is anticipated to be a 10-15 minute presentation. Selection of the groups and the format of these presentations will be decided upon later in the semester. All final presentations (written and oral) will be given when the final exam is scheduled.

Student Peer Evaluation: To evaluate individual performance on group assignments student-peer evaluations will be used during the semester. The criteria used for these evaluations will be developed by the students, and evaluations will be administered confidentially by the instructor. Two evaluations will be used over the semester.

Lab Quizzes: To motivate students to read the Lab Manual BEFORE they come to lab, lab quizzes will be given a number of times over the semester. These quizzes will not be difficult and questions will be based only on material discussed in the current lab's description.

Homework: A number of homework assignments will be assigned during the semester. These assignments will vary from completing problems in the textbook to conducting literature reviews on water reuse to designing sampling strategies for your research project.

Focus of Independent Research Projects:

The laboratory activities for this semester will involve evaluating the potential impact of the acid rock drainage (ARD) associated with the construction of interstate I-99 over Skytop Mountain in Patton Township, Centre County, Pennsylvania. A significant amount of ARD flows into Buffalo Run, although significant efforts have been made to eliminate this pollution. ARD is generated from runoff from "cut faces" and from waste rock piles. Our focus as water quality chemists will be to determine how the water quality changes from near the ARD sources to locations downstream along Buffalo Run. Individual groups will be assigned two particular water sources, and all groups will analyze their source for the same parameters. Data will be shared among all groups for comparative purposes. A significant amount of background information, reports, and water quality data has been previously available on-line at www.dep.state.pa.us - /dep/deputate/fieldops/nc/I_99/ and all students are encouraged to familiarize themselves with this resource.

COURSE SYLLABUS, SPRING 2005:

Dates	Lecture Topics - Reading Assignments	Laboratory Topics
1/17	Introduction – Ch 1	
1/22 1/24	Basic Analytical Concepts - Ch 9,11 Spectrophotometry – Ch 12	Lab Safety: Tour of Teaching Lab
1/29 1/31	General Chemistry – Ch 2 “	Technique Demonstrations: Volumetric Transfers, Dilution, Standard Solutions – Ch 15
2/05 2/07	“ Statistical Analyses – Ch 10	Solids Determination – Ch 26 Turbidity – Ch 13
2/12 2/14	Thermodynamics – Ch 3 “	Standard Solutions – Ch 15 Sulfate – Ch 29
2/19 2/21	“ Phosphate Chemistry – Ch 30	Volumetric Analysis: Alkalinity, acidity, carbonate system – Ch 16, 17, 18
2/26 2/28	Acid/Base Chemistry – Ch 4 “	Organic Matter Analyses: COD, BOD ₇ – Ch 22, 23, 24
3/05 3/07	“ Examination #1	Spectrophotometric Analysis: Determination of N and P – Ch 25, 30
3/19 3/21	Alkalinity Carbonate System – Ch 17,18	Field Sampling Techniques Demonstrations: Field trip to I-99 construction and Buffalo Run
3/26 3/28	“ Metal Solubility: Carbonates	Independent Laboratory Research Period Progress Report # 1 due
4/02 4/04	“ Metal Solubility: Hydroxides	Independent Laboratory Research Period
4/09 4/11	“ “	Independent Laboratory Research Period
4/16 4/18	Metal Solubility Applications: Softening “ – Ch 19	Independent Laboratory Research Period Progress Report # 2 due
4/23 4/25	Metal Solubility Applications: Coagulation “	
4/30 5/02	Metal Solubility Applications: Heavy Metal Removal Examination #2	
5/xx	Research Presentations (2 hr period)	Final Presentation/Report due