ENVS15B Environmental Chemistry 2 and ENVS15L
Spring 2018

Instructor: Helene K. Gardner, Ph.D. email: hkgardner@es.ucsb.edu
Please note that there is another hgardner on campus. Please be careful when emailing me.

Class Times and Location:
Lecture: 11:00-12:15 pm TTh; Buchanan 1940

Lecture Sections:
- W 8:00-8:50 am HSSB 2251 Michael Dannhauser (mdannhauser@umail.ucsb.edu)
- W 6:00-6:50 pm HSSB 4202 Luke Eisenhardt (lmeisenhardt@ucsb.edu)
- Th 8:00-8:50 am Building 387 Room 104 Luke
- Th 6:00-6:50 pm Phelps 2532 Luke
- F 1:00-1:50 pm Phelps 2514 Michael
- F 2:00-2:50 pm Phelps 2514 Michael

Lab Sections:
- T 1:00-3:50 pm Phelps 2525 Zhiping Bao (zbao@umail.ucsb.edu)
- T 5:00-7:50 pm Phelps 2525 Matt Gargiulo (mgargiulo@ucsb.edu)
- W 8:00-11:50 am Phelps 2525 Natalie Shahbol (nshahbol@ucsb.edu)
- W 5:00-7:50 pm Phelps 2525 Natalie
- Th 1:00-3:50 pm Phelps 2525 Zhiping
- Th 5:00-7:50 pm Phelps 2525 Matt

Please note that registration in lecture, section, and lab is required.

Dr. G.’s Office Hours:
- Tuesdays 12:30-2:00 pm in the UCen by Subway
- Wednesday 11:30-3:00 in the UCen by Subway
- Thursdays 2:00-3:00 pm in my office, Bren 4017
- Or by appointment

Please don’t let your inability to come at the scheduled times prevent you from seeking help. I’ll be glad to meet with you at your convenience.

The new Environmental Chemistry series is designed to fulfill the chemistry requirement for environmental studies majors working toward a B.A. degree. Both courses in the two-course series (ENVS15A and 15B) are required, and both must be passed. If you have, unfortunately, gotten caught with part of the old requirement fulfilled (CHEM1A, but not ENVS15), we are sorry, but you will need to take (and get full credit for) both ENVS15A and ENVS15B. This is not a course/series for chemistry or other science majors. Those majors should take the environmental chemistry course offered through the chemistry department, CHEM123.

ENVS 15B is the continuation of an introduction to key chemical principles presented in an environmental context and with a nod to what chemistry is helpful for environmental professionals to know. It picks up where we left off in ENVS 15A with the lithosphere and continues with solutions, chemical reactions, stoichiometry, electrochemistry, pH, the hydrosphere, water quality, gases, and the atmosphere.

Course Objectives:
- Learn fundamental chemical concepts in an environmental context
- Learn basic chemical facts in an environmental context
- Observe, learn, and practice problem solving
Practice finding information, evaluating its veracity, developing an answer to a question, and presenting that answer clearly

Develop laboratory and field testing skills

**Prerequisite:** successful completion of ENVS15A

**Required:**
An iClicker

**Recommended Texts:**

**Tentative Lecture Topics and Order of Presentation:**
We are going to pick up right where we left off:
Finish silicates
Lithosphere, other minerals/anions than silicates, ores, mining
Characteristics of water (intermolecular forces)
Aqueous solutions
Chemical reactions
Oxidation/reduction reactions
Acids and bases, hardness, alkalinity
Sedimentary rock formation
Organic chemistry
Biochemistry
Continental waters
Water quality
Formation of the atmosphere
Behavior of gasses
Interaction of energy w the atmosphere
Cycles
Greenhouse effect

The **final exam** is Wednesday, June 13, 12-3 pm in the same room as lecture. Please be there.

**Grading:** A scientist must have a working knowledge of her subject matter committed to memory. Developing hypotheses requires creativity, but one cannot be creative in a vacuum; creativity uses basic information as a springboard. If you don’t know the basics, it takes the spring out of your board.

For example, if all the fish downstream of a zinc mine die, scientists may be called on to come up with an explanation. A hypothesis based on fact (gee, didn’t we see something like this in western Europe in 1816? don’t fish die when aqueous pH is low? it’s been noticed that all the small mammals near the mine have also disappeared) rather than fantasy (aliens from outer space zapped them with death rays)
or ignorance (beats me why those fish died; must be an unfortunate coincidence) is going to have a greater chance of being correct.

**Memorization** usually comes through repeated use. We will build on material as we go through the course, but some, unfortunately, we will only visit once, so I encourage you to work actively on your own to understand (and memorize) material as it is presented. Problem sets and their answers may be posted on GauchoSpace, but I encourage you to search for others online; there are a lot of them.

Also important to scientists is the ability to **solve problems**. I am looking for you to develop problem-solving skills in this course. That, more than memorization, is what the practice of science entails. I want you to learn how scientists have solved real problems, and I want you to practice doing the same thing. Part of that involves finding, evaluating, and using information. I want you to know where to find information and how to use it. Written homework assignments will develop these skills, as will engaging with lecture and following the solution of an environmental problem as it is resolved. I cannot evaluate your engagement with lecture, as I do not want to grade your iClicker responses, but homework assignments (in the form of papers) will be made several times during quarter.

As in the 15A, your grade will be determined as follows:

- **Quizzes and Papers**: 60%
- **Midterm**: 10%
- **Final Cumulative T/F, Short Answer Exam**: 20%
- **Attendance**: 10%

Happy day! We are able to have lecture sections again this quarter, so there will be **weekly quizzes**.

**Papers** are a significant part of the grade for this course. Expect about three this quarter similar to the ones you wrote last quarter. When I say papers, I mean writing a paper that requires you to research the answer to a question using online resources and report that answer clearly in a specific format. Some format issues will be graded, and failure to comply will reduce your grade. It is also expected that you will use good English. Glaring errors will be marked down. The opportunity for turning in work that is not your own is great when the work is done outside of class. Therefore, the student code of conduct will be enforced with vigor. **Cheating will not be tolerated. If student work is found to be comprised of a significant amount of unoriginal work (without appropriate citation), it will be given a zero.**

Cheating is also a waste of time. A better use of your time would be to actually do the work/learn the material yourself.

**Everyone is expected to take every quiz and write every paper.**

**Late work will not be accepted. However, the lowest of the quiz/paper grades will be dropped.**

What that means is you can get your schedule muffed up – by disease, romance, travel, family issues, whatever – and not have it affect your grade. If disease, romance, travel, family issues, whatever continue to play havoc with your ability to do the work for this class, it will affect your grade. I understand that disease, romance, travel, family issues, whatever happen, but I don’t like playing God and having to decide whose excuse is legitimate and whose isn’t, so, after invoking any excuse (and, therefore not taking one quiz/writing one paper), no excuse will be accepted, and a score of zero will be entered. For those of you who will invoke one of these early in the course, asking for a second quiz or paper grade to be dropped (even with a note from health services this time) won’t work, so try to put off life disruptors as long as possible. Discipline yourself. Many students manage perfect attendance.
**Extra credit will not be given.** My stock answer to requests for extra credit goes something like, “I want you to learn what I tell you I want you to learn, so learn it. Your time is better spent learning that than learning stuff I really don’t care whether you learn or not. Further, if you don’t have time to learn the stuff I want you to learn, how on earth are you going to have time to learn stuff I really don’t care whether you learn or not? Spend your time learning what I want you to learn.”

An in-class **midterm** will be given on Tuesday, May 8, with a **review session** the previous Friday 3:30-6 pm in Bren 4016.

The **final exam** is Wednesday, June 13, 12-3 pm, with a review session also the previous Friday 3:30-6 pm in Bren 4016.

**Attendance means showing up on time and staying until the end.** If you show up late, leave early, fall asleep, or are distracted during class by all the nifty stuff the technology you bring to class can do, you’ll miss some of the course material. I work hard to make the presentation coherent. If you miss part of the presentation, it will be...less coherent. Also, giving you credit for showing up positively reinforces behaviors that adults hope all young people learn: showing up is a big part of success.

iClicker questions will be used to assess attendance in lecture. Full attendance is considered 19 classes, so you get a free pass. **It is your responsibility to make certain that you have your own iClicker, that it is registered to you, that it is functioning, and that your attendance has been recorded.** As a COURTESY, I will have a sign-in sheet for those occasional days when you forget your iClicker, grab the wrong one, or your batteries die in mid-class, but it is not a substitute for a having a working iClicker. I DO NOT KNOW WHY the iClickers OF A FEW OF YOU sometimes do not record your attendance, and it is beyond me to solve that problem. Please see instructional development.

A complement to ENVS 15B is the delightful and practical **laboratory** course, 15L, which must be taken concurrently. It is designed to demonstrate and reinforce concepts critical for a working environmental scientist. Some exercises will provide the opportunity to use equipment to measure parameters in a field setting (#1, 4, 5, 9), others will provide the opportunity to use laboratory techniques and instrumentation (#2, 3, 6, 7, 8), in some instances, to assess the same parameters as those measured in the field, so that you can develop an understanding of the limitations of field measurements. In other exercises, you will observe concepts presented in lecture (#1, 4, 6, 7), and, in still others, you will have the opportunity to become familiar with techniques that form the basis for analyses that you may very well call on a contract lab to perform over the course of your professional careers (#3, 6, 7, 8).

**TENTATIVE lab schedule:**

- **Week 1:** Characteristics of Radiation
- **Week 2:** Recycling an Aluminum Can (please bring an Al can to lab)
- **Week 3:** Analysis of Iron by Visible Spectrophotometry
- **Week 4:** Comparison of Portable pH and NO₃ Measurement Techniques
- **Week 5:** Soil and Water Sampling in the Field, including sample handling and chain of custody
- **Week 6:** Laboratory Testing of Soil and Water Samples Using Ion-Specific Electrodes
- **Week 7:** Alkalinity Titration
- **Week 8:** Chromatography
- **Week 9:** Air Monitoring
- **Week 10:** We may do some make-up labs, but don’t count on it; a lab may slosh over into 2 labs
Laboratory exercises will be posted to GauchoSpace the week before they will be conducted. **You must read them, make a condensed, easy to follow set of instructions for yourself to use in lab, and an easy to fill-in data sheet to be filled in during lab and initialed by your TA before you leave lab. This will be turned in with your lab write-up. You should also prepare for a quiz on the lab to be taken at the start of lab** to demonstrate that you know what the heck you are doing.

**Apparel:**
1. Students must wear a lab coat and protective eyewear; these can be purchased in the bookstore; if you took CHEM 1A, you already have them
2. Legs, ankles, and feet must be covered so that no skin is showing (no shorts, no sandals)
3. Sturdy, closed-toe shoes must be worn
4. Long hair must be pulled back

Eating, drinking, and smoking are not permitted, and smoking is not permitted in the hallway outside of lab. (This is a no smoking campus, so this is a moot point, nevertheless…)

Horseplay will not be tolerated.

There are few possibilities for a missed pre-lab quiz or laboratory exercise to be made up, so please make every effort to attend lab. TAs will try to accommodate students who need to miss a lab, but that means putting an extra person in an already-full lab, which is dangerous. If you know you are going to have to miss and can attend another lab, please contact both TAs. If you still must miss lab, this will be the quiz and lab report the grade for which will be dropped.

The **laboratory write-up format** is as follows:

- **Heading:** Your name, date, course number, and your lab partner’s name
- **Title:** Description of the laboratory exercise
- **Introduction:** Why are we doing the experiment? What question are we asking/hypothesis are we testing/concept are we demonstrating/technique are we practicing? Going into the exercise, what do you think is going to happen?
- **Materials and Methods:** This is where you explain the experimental procedure. In a scientific journal, you explain your procedure in enough detail that someone else could duplicate it. That is not necessary here, but the reader should be able to follow what you did. This should be in your own words, not a copy of the lab hand-out
- **Results:** Your raw data (initialed by the overseeing TA) will be attached but you will present your data in neat tabular and/or graphic form as appropriate
- **Discussion:** What do your data mean? If they are not what you expected, why not? Include an error analysis (% yield, etc.) as appropriate, indicating why your yield was high or low, etc.

This is where you tie your work into what the broader scientific community has elucidated/apply it/answer any questions posed in the laboratory hand-out
Conclusion: What did you learn from the exercise? How would you sum up your findings? Was your hypothesis correct? If not, why not?
Be complete but concise. I’ve seen excellent lab reports in a page. It can be done.

Your grade for ENVS 15B will be determined as follows:

- **Pre-Lab Quizzes:** 40% (minimum)
- **Lab Write-Ups:** 60% (minimum)

**Pre-lab quizzes** are, obviously, a significant part of the grade for this course. Expect one every week on that week’s exercise. The questions on the quizzes will assess your knowledge of the concepts, techniques, and safety precautions of the lab you are about to undertake; they are not trivial. Again, cheating will not be tolerated and the student code of conduct will be enforced with vigor.

**Lab write-ups** are an even bigger part of the grade for this course. Follow the instructions. Cheating will not be tolerated.

**Everyone is expected to take every quiz and do every lab and write it up.**

**Late work will not be accepted. However, the lowest pre-lab quiz score and the lowest lab write-up grade will be dropped.** What that means is you can get your schedule muffed up – by disease, romance, travel, family issues, whatever – and not have it affect your grade. If disease, romance, travel, family issues, whatever continue to play havoc with your ability to do the work for this class, it *will* affect your grade. I understand that disease, romance, travel, family issues, whatever happen, but I discourage TAs from playing God (which they LIKE to do) and deciding whose excuse is legitimate and whose isn’t, so, after invoking any excuse (and, therefore not taking one quiz, doing/writing up one lab), no excuse will be accepted, and a score of zero will be entered. For those of you who will invoke one of these early in the course, asking for second quiz and lab write-up grades to be dropped (even with a note from health services this time) won’t work, so try to put off life disruptors as long as possible. Discipline yourself. Many students manage perfect attendance.

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It’s nice to be with you all again :)