

PELLISSIPPI STATE COMMUNITY COLLEGE
MASTER SYLLABUS

**ANALYTICAL CHEMISTRY
CHEM 2310**

Class Hours: 3.0

Credit Hours: 4.0

Laboratory Hours: 5.0

Date Revised: Summer 2011

Catalog Course Description:

Principles and practices of quantitative measurements in chemical systems are introduced. Chemical equilibria (acid-base, complexometric, and redox), elementary spectrophotometry, chemical separations--including chromatography, ion exchange, and solvent extraction-- are discussed. Course includes 3 hours of lecture and 5 hours of laboratory applications each week.

Entry Level Standards:

Successful completion of CHEM1120 with a grade of 'C' or better.

Prerequisites:

CHEM 1120

Textbook(s) and Other Course Materials:

Daniel C. Harris, "Quantitative Chemical Analysis", Edition TBA.
A bound laboratory notebook.
A scientific calculator capable of 2-dimensional statistical analysis.

I. Week/Unit/Topic Basis:

Week	Topic
1	Measurements; Tools of the trade
2	Experimental error; Statistics
3	Calibration methods
4	Chemical equilibrium
5	Titrations
6	Ionic strength; Activity coefficients
7	Monoprotic and polyprotic acid-base equilibria
8	Acid-base titrations
9	Fundamentals of electrochemistry
10	Fundamentals and applications of spectrophotometry
11	Acid-base titrations

- 12 Introduction to chromatography
- 13 Gas chromatography
- 14 High performance liquid chromatography
- 15 Final Exam Period

II. Course Goals*:

The course will:

- A. Teach students to follow written analytical procedures and write lab reports of sufficient detail that others could repeat the experiment and expect similar results based on detail provided in lab report. VI.1.
- B. Highlight the purpose and importance of calibration techniques as well as be able to solve problems related to calibration methods.
- C. Enhance comprehension of the underlying principles of statistics as they apply to both lecture and lab. VI.1.
- D. Develop students' understanding of the purpose and importance of titrations and their use within analytical chemistry.
- E. Further enhance students' comprehension of chemical and ionic equilibria based on the foundation they acquired in CHEM1120. I.5.
- F. Understand the principles of spectrophotometry and solve problems relating light absorption and emission to concentration. III.1, III.2.
- G. Solve problems dealing with the principles of electrochemistry. I.5.
- H. Calculate efficiencies of separation for solvent extraction and chromatographic processes. I.5.

*Roman numerals after course objectives reference TBR's General Education Goals.

III. Expected Student Learning Outcomes*:

Students will be able to:

- 1. Understand the use and calibration of lab equipment. A
- 2. Prepare a lab notebook for data collection and reference. A
- 3. Understand how solutions are prepared and work solution problems involving dilutions. A
- 4. Understand the safe handling of chemicals and disposal methods of chemical wastes. A
- 5. Work solution problems using the various concentration expressions. B
- 6. Convert given measurements to necessary units needed in solving a particular problem. B

7. Understand the concept of significant figures and perform mathematical operations with them. B
8. Distinguish between the different types of experimental error. B
9. Estimate the uncertainty in measurements. B
10. Determine and understand the statistical analysis of experimental data. B
11. Understand the concepts involving the chemical equilibrium constant, K. C
12. Review acid-base concepts like strength, pH and use of ionization constants. C
13. Determine and use the solubility product constant, K_{sp} , and the effects of complex ion formation. D
14. Understand spectrophotometric concepts like absorbance, transmittance, and Beer's Law, and gain experience with these concepts using instrumentation. E
15. Review the technique of titration and learn a variety of methods to determine information about the analyte. C, D, E, F
16. Review the concepts of electrochemistry and extract chemical information using potentiometry. F
17. Study two means of analytical separations - extraction and chromatography. G

* Capital letters after Expected Student Learning Outcomes reference the course goals listed above.

IV. Evaluation:

A. Testing Procedures and Homework: 50% of grade

- 5 Tests (100 points each)
- Final exam (200 points)
- 4 Problems sets (25 points each)

Problem sets and exams may not be made up if missed. If a test must be missed and has a pre-excused absence, at the instructor's discretion, the value of the test may be added to the value of the final exam. One lab grade may be dropped if all labs are completed.

B. Laboratory Expectations: 50% of grade

Lab notebook – a detailed accounting of the experiment performed each week such that another student could, with reasonable success, repeat the experiment based solely from the contents of the laboratory notebook. Details of steps taken, results of each step of an experiment and detailed interpretation of the experimental results are expected for each laboratory experiment. Attention to detail is imperative.

Attendance is required for all scheduled lab meetings. All labs must be completed by the end of the last scheduled lab meeting. Lab notebooks will be collected at this meeting. See lab schedule for order of lab experiments and dates of lab meetings. If a lab is missed, there are no make-up labs under any circumstances.

C. Field Work:

N/A

D. Other Evaluation Methods:

N/A

E. Grading Scale:

90.0-100.0	A
87.5-89.9	B+
80.0-87.4	B
77.5-79.9	C+
70.0-77.4	C
60.0-69.9	D
0.0-59.9	F

V. Policies:

A. Attendance Policy:

Pellissippi State expects students to attend all scheduled instructional activities. As a minimum, students in all courses (excluding distance learning courses) must be present for at least 75 percent of their scheduled class and laboratory meetings in order to receive credit for the course. Individual departments/programs/disciplines, with the approval of the vice president of Academic Affairs, may have requirements that are more stringent. In very specific circumstances, an appeal of the policy may be addressed to the head of the department in which the course was taken. If further action is warranted, the appeal may be addressed to the vice president of Academic Affairs.

B. Academic Dishonesty:

Academic misconduct committed either directly or indirectly by an individual or group is subject to disciplinary action. Prohibited activities include but are not limited to the following practices:

- Cheating, including but not limited to unauthorized assistance from material, people, or devices when taking a test, quiz, or examination; writing papers or reports; solving problems; or completing academic assignments.
- Plagiarism, including but not limited to paraphrasing, summarizing, or directly quoting published or unpublished work of another person, including online or computerized services, without proper documentation of the original source.
- Purchasing or otherwise obtaining prewritten essays, research papers, or materials prepared by another person or agency that sells term papers or other academic materials to be presented as one's own work.
- Taking an exam for another student.
- Providing others with information and/or answers regarding exams, quizzes, homework or other classroom assignments unless explicitly authorized by the instructor.
- Any of the above occurring within the Web or distance learning environment.

C. Accommodations for disabilities:

Students who need accommodations because of a disability, have emergency medical information to share, or need special arrangements in case the building must be evacuated should inform the instructor immediately, privately after class or in her or his office. Students must present a current accommodation plan from a staff member in Services for Students with Disabilities (SSWD) in order to receive accommodations in this course. Services for Students with Disabilities may be contacted by going to Goins 127, 132, 134, 135, 131 or by phone: 539-7153 or TTY 694-6429. More information is available at <http://www.pstcc.edu/sswd/>.

D. Other Policies:

Cell Phone Policy:

Cell phones are expected to remain off or in a silent mode. Vibrate mode is not acceptable as this is just as distracting to the class as a ring. If there are special, verifiable circumstances, exceptions may be made at the discretion of the professor. Texting during class is not allowed. If anyone is caught using their cell phone during an exam, the student will be charged with academic dishonesty (see section titled "Academic Dishonesty" for further information).

Classroom Conduct:

I require the classroom to maintain a quiet atmosphere that is maximally conducive to learning the material. Questions are ALWAYS encouraged but talking in class, texting and other distractive behavior is not. If you are interrupting or distracting the class from what I am saying, I WILL call you out on it. If it is a persistent problem, you will be required to leave and not be allowed to return to class until having met with the Dean and myself. Laptops will conditionally be allowed if they are used solely for the purpose of note taking or some other classroom-related activity AND the user sits in the front of the classroom so that I may monitor what it is being used for. If your use of the laptop becomes a distraction to myself or others, it will no longer be allowed in class.