PELLISSIPPI STATE TECHNICAL COMMUNITY COLLEGE
MASTER SYLLABUS

ANALYTICAL CHEMISTRY
CHEM 2310

Class Hours: 3.0  Credit Hours: 4.0
Laboratory Hours: 5.0  Revised: Fall 2006

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:

One year of general college chemistry is necessary for entrance into the course.

Prerequisite:

CHEM 1120

Textbook(s) and Other Course Materials:

A bound laboratory notebook.
A calculator capable of statistical analysis.

I. Week/Unit/Topic Basis:

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
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<tbody>
<tr>
<td>1</td>
<td>Measurements; Tools of the trade</td>
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<tr>
<td>2</td>
<td>Experimental error; Statistics</td>
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<tr>
<td>3</td>
<td>Calibration methods</td>
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<tr>
<td>4</td>
<td>Chemical equilibrium</td>
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<tr>
<td>5</td>
<td>Titration</td>
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<tr>
<td>6</td>
<td>Ionic strength; Activity coefficients</td>
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<tr>
<td>7</td>
<td>Monoprotic and Polyprotic acid-base equilibria</td>
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<tr>
<td>8</td>
<td>Acid-base titrations</td>
</tr>
<tr>
<td>9</td>
<td>Fundamentals of electrochemist</td>
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<tr>
<td>10</td>
<td>Fundamentals and Applications of spectrophotometry</td>
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</tbody>
</table>
II. Course Objectives*

A. Follow written analytical procedures and write lab reports understandable to others. VI.1.
B. Understand the underlying principles of statistics in both lecture and lab. VI.1.
C. Understand chemical equilibria. I.5.
D. Understand ionic equilibria. I.5.
E. Understand the principles of spectrophotometry and solve problems involving light absorption and emission. III.1, III.2.
F. Solve problems dealing with the principles of electrochemistry. I.5.
G. Calculate efficiencies of separation for solvent extraction and chromatographic processes. I.5.

*Roman numerals after course objectives reference TBR’s general education goals.

III. Instructional Processes*

Students will:

1. Generate analytical data within acceptable limits of experimental error. Technological Literacy Outcome, Mathematics Outcome, Natural Sciences Outcome
2. Become proficient in classical and instrumental methods of quantitative chemical analysis common to modern analytical laboratories. Technological Literacy Outcome, Transitional Strategy, Natural Sciences Outcome
3. Utilize current chemical reference literature. Communication Outcome, Natural Sciences Outcome, Technological Literacy Outcome
4. Record experimental data and conclusions in a laboratory notebook in a manner acceptable for research and industry. Communication Outcome, Transitional Strategy, Natural Sciences Outcome
5. Determine appropriate method of chemical analysis for a substance based upon certain various physical and chemical parameters. Technological Literacy Outcome, Active Learning Outcome
6. Understand the theories and principles which underlie observed chemical processes. Communication Outcome, Mathematics Outcome, Natural Sciences Outcome
*Strategies and outcomes listed after instructional processes reference TBR’s goals for strengthening general education knowledge and skills, connecting coursework to experiences beyond the classroom, and encouraging students to take active and responsible roles in the educational process.

IV. Expectations for Student Performance*:

Upon successful completion of this course, the student should 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, Ksp, 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

*Letters after performance expectations reference the course objectives listed above.

V. Evaluation:

A. Testing Procedures: 50% of grade
   - 4 tests(100 points each)
   - Final exam (100 points)
   - Problems sets(25 points each)
Problem sets and exams may not be made up if missed. The Final Exam may be worth more for an excused missed exam. One lab grade may be dropped if all labs are completed.

B. Laboratory Expectations: 50% of grade

Lab notebook - accuracy of results and experimental write-up.
Attendance is required for 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.

C. Field Work:
N/A

D. Other Evaluation Methods:
N/A

E. Grading Scale:

<table>
<thead>
<tr>
<th>Score Range</th>
<th>Grade</th>
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<tbody>
<tr>
<td>90-100</td>
<td>A</td>
</tr>
<tr>
<td>80-89.9</td>
<td>B</td>
</tr>
<tr>
<td>70-79.9</td>
<td>C</td>
</tr>
<tr>
<td>60-69.9</td>
<td>D</td>
</tr>
<tr>
<td>&lt;60</td>
<td>F</td>
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VI. Policies:

A. Attendance Policy:

Pellissippi State Technical Community College expects students to attend all scheduled instructional activities. As a minimum, students in all courses must be present for at least 75 percent of their scheduled class and laboratory meetings in order to receive credit for the course.

B. Academic Dishonesty:

With any form of valid proof of dishonesty with regard to student work or testing, the instructor may elect from a range of actions. Academic misconduct could lead to failure for the assignment, and/or the entire course on consultation with the program coordinator and Department Head. Additionally, dismissal from the institution is an option and may be sought.

C. Accommodations for disabilities:

If you need accommodations because of a disability, if you have emergency medical information to share, or if you need special arrangements in case the building must be evacuated, please inform the instructor immediately. Please see the instructor privately after class or in his/her 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 or 131 or by phone: 694-6751 (Voice/TTY) or 539-7153.

Posted: September 21, 2006