CHE 230 – Chemical Analysis – Spring 2012

Instructor
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Office Hours
M 9:20 – 10:20 am
W 12:50 – 1:50 pm
Others by appointment

Lecture M,W,F 10:30 – 11:30 am HSC 357

Lab W 2:00 – 5:00 pm HSC 358

Text
Harvey, David. *Analytical Chemistry 2.0*. Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Unported License. 2011. Free download available at:
http://www.asdlib.org/onlineArticles/ecourseware/Analytical%20Chemistry%202.0/Text_Files.html

Course Description (from the catalog)
A study of the theoretical foundation and skills necessary for the solution of problems encountered in the area of quantitative chemical analysis, including classical and modern methods. Emphasis is given to the evaluation and presentation of data, sampling, equilibrium dynamics of analytically important reactions, experimental design, volumetric techniques, absorption and emission spectroscopy, electrochemical methods, and analytical separations. Examples and laboratory exercises will include environmental air, soil and water systems. Prerequisites: CHE 117, and MTH 131 or 141.

Objectives
- To review and build on skills from CHE 117 that will be used in chemical analysis.
- To interpret and evaluate real-world data from an analytical perspective.
- To use appropriate experimental design (including quality control) to approach an analytical problem.
- To use various analytical techniques, including classical (volumetric, gravimetric) techniques, spectroscopy, and chromatography.
- To become familiar with the literature of analytical chemistry including standard methods.

Course Policies
- **Students will not be permitted to make up an exam unless permission is granted from the instructor prior to the scheduled exam.**
- **Attendance to class and laboratory is mandatory.**
    - 3 unexcused absences result in lowering of the student's grade by 1 letter grade.
    - 5 or more unexcused absences may result in a failing grade for the course.
- Students are responsible for all class work, quizzes, homework, labs, and lectures whether in attendance or not.
- Students may arrange for make-up work for excused absences. An excused absence will be granted at the discretion of the instructor.
- Arranging make-up work is the responsibility of the student and should be completed within two weeks time of the scheduled work.
- A grade of zero will be given for work not made up and for work missed due to unexcused absences.
- **Late work will be penalized 10% for each day that it is late.**

Academic Integrity
The College's Academic Integrity Policy (AIP) will be strongly enforced. Violations of the AIP include cheating, misconduct, plagiarism, and providing false information. Academic dishonesty will not be tolerated. The first citation for academic dishonesty will result in a zero grade for the specific assignment. The second citation will result in a failing grade for the course. All citations for academic dishonesty will be reported to the Dean of the College, in accordance with college policy. Details of the AIP can be found in the *Westminster College Undergraduate Catalog*.

Grading System

Grade Scale			***Point Distribution***	
A		≥ 93%		
93% >	A-	≥ 90%	Quizzes	10%
90% >	B+	≥ 87%	Homework Problems	10%
87% >	B	≥ 83%	Articles/Group Work	10%
83% >	B-	≥ 80%	Exams (3)	30%
80% >	C+	≥ 77%	Research Project	10%
77% >	C	≥ 73%	Final	10%
73% >	C-	≥ 70%	Laboratory	20%
70% >	D	≥ 60%		
F		≤ 60%		

Quizzes

Short quizzes will be given weekly on ***Mondays.*** These will be based on the reading assignment as well as the previous week's notes. Students will not be permitted to make up a quiz; however, a student's lowest quiz grade may be dropped.

Articles /Group Work

A journal article that corresponds to the weekly topic will be due on ***Wednesdays*** (posted on Fridays). Students will be expected to read and answer questions associated with the article. The article will be discussed in a "journal club" format in small groups. Grades will be based on individual and team quiz scores (IFAT methodology). Article quizzes may not be made up, but a student's lowest quiz score can be dropped. Other in-class group work may also be graded.

Homework Problems

Practice problems will be assigned from the text. Graded problems will be provided as supplementary material (posted on Mondays). Problems will be graded and collected on ***Fridays.***

Tentative Weekly Format

Mon – Quiz, notes on weekly topic
Wednesday – Group work/articles, pre-lab, lab
Friday – review of homework problems, post-lab

Research Project

For the research project, the student will choose to analyze one particular analyte in one particular matrix. A statistical comparison must be made of either two different analytical techniques or two different sample preparation techniques for the same analysis. Three weeks will be given to complete the project. A formal write-up of the project and a poster presentation will be used to evaluate the work. Details will be provided on a separate hand-out. *This hand-out will include a rubric for the formal report. This formal report will also have to undergo peer-editing before submission.*

Laboratory

Learning of analytical chemistry is done mainly in the laboratory. For this reason, the course is scheduled around various lab topics. "Lectures" will be reserved mainly to discuss lab methods/techniques (pre-lab) or to review collected data and/or perform data analysis (post-lab). A laboratory notebook with carbonless copies must be kept according to standard guidelines (details provided separately). The laboratory will be evaluated based on attendance, notebook pages, and write-ups. Students will not be permitted to make up a lab; however, with permission from the instructor, a student may use another student's data to complete the laboratory assignment.

Tentative Topic Schedule

Week 1 – accuracy, precision (Chpts 1-3)
Week 2 – statistics (Chpt 4)
Week 3 – titration (Chpt 9)
Week 4 – buffers, acid-base chemistry (Chpt 6)
Week 5 – gravimetric analysis (Chpt 8)
Week 6 – UV-VIS (Chpt 10)
Week 7 – fluorescence (Chpt 10)
Week 8 – atomic absorption (Chpt 10)
Week 9 – column chromatography (Chpt 12)
Week 10 – HPLC (Chpt 12)
Week 11 – GC (Chpt 12)
Week 12 – research project (GC-MS; supplemental material)
Week 13 – research project (electrochemistry; Chpt 11)
Week 14 – research project (quality control; Chpt 15)

Important Dates

Wed. Feb. 15th – Exam #1
Week of Mar. 11th – Library Session *tentative*
Mon. Mar. 19th – Research Project Outline Draft Due
Wed. Mar. 21st – Exam #2
Wed. Apr. 4th – Field Trip to Jennings Environmental Education Ctr (12:00pm-5:30pm) *tentative*
Wed. Apr. 18th – Exam #3
Wed. Apr. 25th – No Class/Lab – Attend URAC
Fri. May. 4th – Final Exam (10:30-12:00 or 2:00-3:30)
Tues. May. 8th – Poster Presentations (10:30-12:00) & Lab Clean-up (12:00-2:00) OR
Thurs. May 10th – Poster Presentations (2:00-3:00) & Lab Clean-up (3:00-5:30)

Extra Credit

Extra credit can be obtained by attending chemistry department seminars or by attending outside chemistry-related talks. A one-page summary of the seminar/talk is required. Extra credit can also be obtained by "analytical/environmental chemistry in the news." For this type of extra credit, a copy of the article and a one-page summary are required. Alternatively, a one-page summary of a journal article related to analytical/environmental chemistry may be submitted (along with the complete article) for extra credit.

A total of three extra credit assignments (each worth up to 0.75%) may be submitted.