Chem 380 – Instrumental Analysis - Fall 2009

Lecture – Nobel Hall 305, M, W, Th, F – 11:30 AM -12:20 PM
Laboratory – Nobel Hall 202, Monday 1:30-5:30 PM

Instructor – Dwight R. Stoll
Office – Nobel Hall 203
Campus Phone – x6304, Home Phone – 507-934-0019
Email – dstoll@gustavus.edu
Office Hours – By appointment or by chance

Required Materials

1. Textbook – Principles of Instrumental Analysis, 6th edition, by Skoog, Holler, and Crouch
2. Approved laboratory eyeware

Course Goal – To provide a learning framework within which students can effectively and efficiently develop a level of competence with modern instrumental methods of analysis that will allow direct application of the principles learned in future work, and/or serve as a solid foundation for further study of instrumental techniques in graduate or professional school.

Course Objectives

1. To learn and apply the fundamental concepts common to all instrumental methods of analysis
2. To gain an appreciation for the theoretical basis of a variety of common analytical laboratory instruments, and to become comfortable with their operation through hands-on experience
3. To recognize the significance of instrumental analysis in both public life and in science
4. To improve written and oral communication, and interpersonal skills
5. To enjoy learning about chemistry and science

Grading – Evaluation of performance in the course will be based upon a variety of activities including problem sets, quizzes, exams, and laboratory reports. The number and point assignment for each of these activities is given below.

Activity	Number of Events	Points Per Event	Total Points
Feedback and Participation	12	5	60
Problem Sets	6	25	150
Paper Discussion	1	50	50
Quizzes	5	25	125
Mid-term Exams	2	150	300
Final Exam	1	250	250
Laboratory Reports	6	75	450
Laboratory Project	1	200	200
		Course Point Total	**1585**

Letter grades will be assigned based upon the following scale. ***The instructor reserves the right to lower these cutoffs under special circumstances, however the cutoffs will not be raised under any circumstances.***

% of Points	Letter Grade	% of Points	Letter Grade
92-100	A	75-78	C+
88-92	A-	70-75	C
85-88	B+	67-70	C-
81-85	B	60-67	D
78-81	B-	<60	F

Communication: I strongly prefer communication by email over voicemail. When attaching files, please use the following file-naming convention:

2009-XX-YY 'your initials' 'short description'

For example, in submitting a report for experiment #2 I would use the following filename:
2009-09-01 drs expt 2 report.doc

Course Content – A large majority of the content that will be covered in lecture can be broken down into seven categories. We will cover topics in more or less this order, with the intention of aligning classroom topics with laboratory experiments.

1. Introduction to Instrumental Methods, Figures of Merit, and Quantitation
2. Sample Preparation
3. Separations
4. Mass Spectrometry
5. Spectroscopy
6. Electrochemistry
7. Electronics, Signal Processing, and Data Analysis

Course Calendar

Monday	Tuesday	Wednesday	Thursday	Friday
September				
7	8	9– Classes Begin Introduction	10	11
14	15	16	17 **Quiz-1**	18
21 **PS - 1 Due**	22	23	24	25
28	29	30		
October				
			1 **Exam-1**	2
5	6	**7 - Nobel Conference** **No Class**	8	9
12 **PS – 2 Due**	13	14	15 **Quiz - 2**	16
19	20	21	22	23
26– No Class **Reading Day**	27	28	29 **Quiz - 3**	30
November				
2 **PS – 3 Due**	3	4	5 **Exam - 2**	6
9	10	11	12	13
16	17	18	19 **Quiz - 4**	20
23 **PS – 4 Due**	24	**25 – Thanksgiving Break** **No Class**	**26 – Thanksgiving Break** **No Class**	**27 – Thanksgiving Break** **No Class**
30				

December				
	1	2	3	4
7	8	9	10 **Quiz - 5**	11
14 – Last Day of Class **PS – 5 and 6 Due**	15	**16 – Reading Day**	17	19
21 – Final Exam **3:30-5:30 PM** **Nobel Hall 305**	23	**Happy Holidays!!**		

Laboratory Activity

Experiments and Reports: The organization of the approach to laboratory work in the course will be explained and discussed extensively in class. You will work in teams of two or three to complete six pre-determined experiments, as well as a project designed by you. For each of the six pre-determined experiments, there will be one lead author of the full laboratory report, and the other team members will act as supporting authors, mainly serving to provide feedback and editorial support to the lead author. Team members will rotate through the roles of lead and supporting authors, and each member of the team will receive the same score for a given experiment. In the case of the report for your project, each group member will be responsible for different sections of the report. Please see the laboratory introduction for extensive commentary and suggestions regarding the format of the full laboratory report. A preliminary draft is due to the instructor one week after completion of the experiment in the laboratory. Comments from the two supporting authors should accompany the initial draft. You will receive feedback from the instructor in a timely manner. A final draft of the report is due two weeks after the experiment is completed in the laboratory.

We will use the laboratory meeting time on the last day of class for each group to present a summary of their project to the class.

Laboratory Safety: You will be expected to take reasonable measures in the laboratory to ensure the safety of you and your peers. This includes clear labeling of all containers, responsible and organized collection of waste materials, and wearing protective eyeware at all times in the laboratory, even when you may not be working with chemicals *per se*.

Details

Readings – Recommended readings will be announced via the course website. The readings will typically be from the Skoog text, but will also occasionally include supplemental material.

Feedback and Participation – You are asked to complete several short 'quizzes' online, typically before each time that we meet for lecture/discussion. These 'quizzes' are more like surveys than quizzes, as you will be given full credit for simply completing the questions as long as there is evidence that you have given reasonable thought to preparing your response. These surveys will be used to gather a variety of information, including your understanding of previous lecture material and readings, to help me in effectively preparing subsequent lecture and discussion topics.

Problem Sets – The six problem sets (Indicated by PS-X in the calendar) assigned throughout the semester will be a combination of problems from the text, and problems prepared by me. Details of each problem set will be announced on the Moodle site. You are encouraged to work with peers in completing these assignments, however each student must submit his/her own work. Problem sets are due at the beginning of class on the days indicated on the calendar above. Grading of the problem sets will be accomplished according to the following scheme:

- Wrong answer, but a genuine attempt to solve the problem – 1/3 credit
- Wrong answer, but at least half of the logic is correct – 1/2 credit
- Correct answer – Full credit

Late Work – The number of points awarded for a particular problem set will decrease by 50 % for every day that lapses between the due date and the date that the work is turned in; problem sets are due at the beginning of lecture.

Paper Discussion – The history of the development of analytical chemistry and instrumental methods is very rich; it is interesting to reflect on the tremendous advances in technology and theory that have been made in the last century. As part of our discussion of different methodologies we will review and discuss some of the most influential papers in the last 50 years. These papers are quite often short, but also are very rich with ideas, and clear demonstrations of how the technique being discussed might change the way a particular measurement is made. You will be asked to thoroughly review one of these papers, and lead a discussion in class on the significance of the paper, in the context of this course. The absolute minimum will be a 15-minute presentation of the paper, using whatever tools (handouts, PowerPoint, etc.) you think will be effective to convey your message; you may use more than the 15 minutes if you like. We will discuss this in more detail in class, and you will be given a detailed grading rubric.

Quizzes – The five quizzes throughout the semester will be completed in class and will be 15 to 20 minutes in length. These quizzes will primarily be used as a diagnostic tool to assess your understanding of the material as we progress toward each exam. The quizzes will be closed book and closed note, and will be taken under the guidelines of the Honor Code.

Mid-Term Exams – The two mid-term exams will be given in class and will be 50 minutes in length. Each of these exams should be considered comprehensive. The exams will be closed book and closed note, and will be taken under the guidelines of the Honor Code.

Final Exam – The final exam will be 120 minutes in length, and will cover material discussed both in lecture and in the laboratory.

All exams are considered comprehensive

Missed Exams/Quizzes – Examinations and quizzes **will not be made up if missed**, unless due to circumstances beyond your control. If you will miss an exam due to circumstances beyond your control, you must contact me no later than one hour **prior to** the exam. You can call my office, home or e-mail me. If neither of these work, please contact the Department office at x7320 or as a last resort, the Dean of Students office.

Honor Code: The following code will be written in full and signed on every examination and certain specified graded papers:

"On my honor, I pledge that I have not given, received, or tolerated others' use of unauthorized aid in completing this work."

Gustavus Adolphus College is proud to operate under an honor system. The faculty and students have jointly created an Honor Board to enforce this policy. In signing this statement a student is promising that his or her work complies fully with the authorized aid as defined by the professor. It is each professor's responsibility to state course penalties for academic honesty policy violations, and to define the level of authorized aid appropriate to the work in the course or to the particular assignment. However, the student is responsible to ask questions about any reasonable doubt regarding the professor's definition.

The following Gustavus website information will be valuable in explaining details:

http://gustavus.edu/deanofstudents/gustavusguide/academicpolicies.pdf

In Chemistry 380 all examinations will conducted under the honor code. Penalty for violating the code will be a score of zero on the exam.

Laboratory experiments and problem sets in this course are collaborative, and collaboration on them is not only legal but also encouraged. Plagiarism on lab reports does, however, constitute a breach of the code. Proper citation procedures are discussed in the lab manual. If you are unsure of what constitutes plagiarism, ask your instructor and/or see the Gustavus website.

Students with Disabilities - Any student with a documented disability, needing academic adjustments or accommodations, is requested to speak with me during the first two weeks of class. All discussions will remain confidential. Such students also need to contact Student Disability Services in the Advising and Counseling Center in Johnson Student Union.

Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act (1990) work together to ensure 'reasonable accommodation' and non-discrimination for students with disabilities in higher education. A student who has a physical, psychiatric/emotional, medical, learning, or attention disability that may have an effect on the student's ability to complete assigned course work should contact the Disability Services Coordinator in the Advising Center, who will review the concerns and decide with the student what accommodations are necessary.

The information listed on the course web site, in the syllabus, and in associated documents is subject to change at the discretion of the instructor.