

## Chem 380 – Instrumental Analysis - Fall 2012

**Lecture** – Nobel Hall 305, M, T, W, F – 11:30 AM -12:20 PM

**Laboratory** – Nobel Hall 202, Monday/Tuesday 1:00-5:30 PM

**Instructor** – Dwight R. Stoll, Ph.D.

**Office** – Nobel Hall 203

**Campus Phone** – x6304, Google Voice – 507-933-0699

**Email** – dstoll@gustavus.edu

**Office Hours** – By appointment or by chance – check my Google Calendar in the ‘About’ tab of my website

**Course website** – [www.multidlc.com/drstoll](http://www.multidlc.com/drstoll)

### Required Materials

1. Textbooks
  - a. Modern HPLC for Practicing Scientists (either purchase or loan from library)
  - b. Introduction to Open-Tubular Column Gas Chromatography (either purchase or loan from library)
2. Bound paper laboratory notebook
3. Approved laboratory eyewear

**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
Participation	1	100	100
Problem Sets	7	20	140
Feedback	5	5	25
Quizzes	5	25	125
Mid-term Exams	2	150	300
Final Exam	1	200	200
Laboratory Reports	2	200	400
Laboratory Project	1	200	200
		<b>Course Point Total</b>	<b>1515</b>

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.***

<b>% of Points</b>	<b>Letter Grade</b>	<b>% of Points</b>	<b>Letter Grade</b>
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:

2010-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
<b>September</b>				
3	4 Classes Begin, Introduction	5 DS at MSP Research Conf.	6	7 Lab Intro, SPE Pre-Lab
10 Sample Prep-2	11 Sample Prep-3	12 Sample Prep-4 Quiz-1	13	14 Quantitation-1
17 Quantitation-2	18 Quantitation-3	19 Sepn-1	20	21 Sepn-2, GC/FID Pre-Lab
24 Sepn-3	25 Sepn-4	26 Sepn-5, Quiz-2	27	28 HPLC/UV Pre-Lab Sepn-6
<b>October</b>				
1 Exam-1	2 Nobel Conference		4	5 GC/MS Pre-Lab MS-1
8 MS-2	9 MS-3	10 MS-4	11	12 HPLC/MS Pre-Lab MS-5
15 MS-6	16 Sepn-7	17 Sepn-8	18	19 Sepn-9 Quiz-3
22 Reading Days		24 Sepn-10	25	26 UV/Vis Pre-Lab Sepn-11
29 Spec-1	30 Spec-2	31 Spec-3 Quiz-4		
<b>November</b>				
			1	2 Fluorescence Pre-Lab, Spec-4
5 Spec-5	6 Spec-6	7 Exam-2	8	9 Electronics/LabView Pre-Lab, E&SP-1
12 DS at Eastern Analytical Symposium			15	16 E&SP-5
E&SP-2	E&SP-3	E&SP-4		
19 E&SP-6	20 E&SP-7	21-23 Thanksgiving Break		
26 Echem-1	27 Echem-2	28 Echem-3	29	30 Echem-4
<b>December</b>				
3 Echem-5	4 Sepn-12	5 Sepn-13, Quiz-5	6	7 Sepn-14
10 Sepn-15	11 Sepn-16	12 Sepn-17	13	14 Last Day of Classes
17	18 Final Exam 10:30-12:30 NHS 305			

## 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 a supporting author, mainly serving to provide feedback and editorial support to the lead author. Team members will rotate through the roles of lead and supporting authors. 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 supporting author 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 during the last week 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 eyewear at all times in the laboratory, even when you may not be working with chemicals *per se*.

## Details

**Readings and Preparation** – Recommended reading and preparation material will be suggested via the course website.

**Feedback** - You are asked to complete several short ‘quizzes’ online. 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.

**Participation** – You are expected to ‘participate’ in the course in a broad sense. One way this will be measured is through the selection of a particular role or project for the class. The terms of this role or project will be negotiated on a case-by-case basis with the instructor; more detail on this will be provided in a separate handout.

**Problem Sets** – The seven problem sets assigned throughout the semester will be a combination of problems from the texts, and problems prepared by me. Details of each problem set will be announced on the course website. 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 days negotiated during the semester. 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.

**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/policies/gustieguide/academic-policies.php>

In Chemistry 380 all examinations will be 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. Under no circumstances will fabrication of laboratory data be tolerated. The penalty for such misconduct will be a score of zero on the lab report for the experiment in question, and your academic advisor and the Dean of students will be notified of your actions.

**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.

**English Language Learners** - Support for English Language Learners (ELL) and Multilingual students is available via the College's ELL Support staff person, Andrew Grace ([agrace@gustavus.edu](mailto:agrace@gustavus.edu) or x7395). He can meet individually with students to consult about academic tasks and to help students seek other means of support. The ELL Support person can also consult with faculty members who have ELL and multilingual students enrolled in their classes. The College's ELL staff person can provide students with a letter to a professor that explains and supports academic accommodations (e.g. additional time on tests, additional revisions for papers). Professors make decisions based on those recommendations at their own discretion. In addition, ELL and multilingual students can seek help from peer tutors in the Writing Center.

*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.*