Course	**CHEM 3472-501** **Instrumental Analysis**
Professor	Lynn A. Melton
Term	Spring 2008
Meetings	Lecture M-W 5:30-6:45 BE3.102 Laboratory M-W 6:45-9:45 BE3.314

Professor's Contact Information

Office Phone	972-883-2913
Other Phone	None
Office Location	FN3.308A (Go to NS&M Dean's office, follow corridor to the west)
Email Address	melton@utdallas.edu
Office Hours	Wednesday 11:00-12:00, by appointment, or just come by
	WebCT will be used routinely for announcements, posting of course materials, etc.
Other Information	Use of standard computational programs, such as EXCEL, will be required. Contact the instructor early in the course if assistance is needed.

General Course Information

Pre-requisites, Co-requisites, & other restrictions

Prerequisite: CHEM 2401 Quantitative Analysis

Course Description

CHEM 3472 Instrumental Analysis (*4 semester hours*) Basic processes, instrumentation and applications of ultraviolet, visible, fluorescence, atomic and mass spectroscopy, electrochemistry, surface and microanalysis, and separations. Emphasis will be placed upon acquisition, treatment, and interpretation of data and report writing. Prerequisite: CHEM 2401. (2-6) Y

Learning Outcomes

Outcomes:

Given access to the required textbook, to classroom lectures, to written descriptions of laboratory modules, to laboratory equipment, materials, and supplies, and to assistance from the instructor and teaching assistants, students will

1. Be able to describe the physical principles and key components of major types of analytical instrumentation;

   Assessment: by successful performance on (1) examinations, (2) graded homework assignments, and (3) graded lab reports/lab books

2. Be able to demonstrate skilled laboratory work and methods development with common analytical instrumentation, particularly spectroscopic and chromatographic methods;

Assessment: (1) by evaluation of readiness and performance during laboratory periods, (2) by successful performance on graded lab reports/lab books, and (3) by successful performance on laboratory-related questions on examinations

3. Be able to analyze and interpret data through understanding and use of computational and statistical methods in analytical chemistry.

   Assessment: by successful performance on (1) graded lab reports/lab books, (2) graded homework assignments, and (3) statistics and/or data analysis-related questions on examinations

Required Texts & Materials

Contemporary Instrumental Analysis (2000) Kenneth A. Rubinson and Judith F. Rubinson (**required**)

Lab Book: "Roaring Springs Composition Book", Quad. Rules 5 to 1", Bar Code 70972 77255, available in UTD Bookstore **required**).

Other course materials may be recommended or required.

Suggested Texts, Readings, & Materials

None at this time

Assignments & Academic Calendar

[Topics, Reading Assignments, Due Dates, Exam Dates]

See Appendix A (at end)

Course Policies

Grading (credit) Criteria	**See Appendix B (at end)**
Make-up Exams	**None; points are rolled forward to next exam**
Extra Credit	**None**
Late Work	**Accepted at the sole discretion of the instructor**
Special	**None; syllabus is complete**

Assignments	
Class Attendance	**Used in determination of whether mercy is justified**
Classroom Citizenship	**Highest level is expected**
Field Trip Policies	**No off campus trips**
Student Conduct and Discipline	The University of Texas System and The University of Texas at Dallas have rules and regulations for the orderly and efficient conduct of their business. It is the responsibility of each student and each student organization to be knowledgeable about the rules and regulations which govern student conduct and activities. General information on student conduct and discipline is contained in the UTD publication, *A to Z Guide*, which is provided to all registered students each academic year. The University of Texas at Dallas administers student discipline within the procedures of recognized and established due process. Procedures are defined and described in the *Rules and Regulations, Board of Regents, The University of Texas System, Part 1, Chapter VI, Section 3*, and in Title V, Rules on Student Services and Activities of the university's *Handbook of Operating Procedures*. Copies of these rules and regulations are available to students in the Office of the Dean of Students, where staff members are available to assist students in interpreting the rules and regulations (SU 1.602, 972/883-6391). A student at the university neither loses the rights nor escapes the responsibilities of citizenship. He or she is expected to obey federal, state, and local laws as well as the Regents' Rules, university regulations, and administrative rules. Students are subject to discipline for violating the standards of conduct whether such conduct takes place on or off campus, or whether civil or criminal penalties are also imposed for such conduct.
Academic Integrity	The faculty expects from its students a high level of responsibility and academic honesty. Because the value of an academic degree depends upon the absolute integrity of the work done by the student for that degree, it is imperative that a student demonstrate a high standard of individual honor in his or her scholastic work. Scholastic dishonesty includes, but is not limited to, statements, acts or omissions related to applications for enrollment or the award of a degree, and/or the submission as one's own work or material that is not one's own. As a general rule, scholastic dishonesty involves one of the following acts: cheating, plagiarism, collusion and/or falsifying academic records. Students suspected of academic dishonesty are subject to disciplinary proceedings. Plagiarism, especially from the web, from portions of papers for other classes, and from any other source is unacceptable and will be dealt with under the university's policy on plagiarism (see general catalog for details). This course will use the resources of turnitin.com, which searches the web for possible plagiarism and is over 90% effective.
Email Use	The University of Texas at Dallas recognizes the value and efficiency of communication between faculty/staff and students through electronic mail. At the same time, email raises some issues concerning security and the identity of each individual in an email exchange. The university encourages all official student email correspondence be sent only to a student's U.T. Dallas email address and that faculty and staff consider email from students official only if it originates from a UTD student account. This allows the university to maintain a high degree of confidence in the identity of all individual corresponding and the security of the transmitted

	information. UTD furnishes each student with a free email account that is to be used in all communication with university personnel. The Department of Information Resources at U.T. Dallas provides a method for students to have their U.T. Dallas mail forwarded to other accounts.
Withdrawal from Class	The administration of this institution has set deadlines for withdrawal of any college-level courses. These dates and times are published in that semester's course catalog. Administration procedures must be followed. It is the student's responsibility to handle withdrawal requirements from any class. In other words, I cannot drop or withdraw any student. You must do the proper paperwork to ensure that you will not receive a final grade of "F" in a course if you choose not to attend the class once you are enrolled.
Student Grievance Procedures	Procedures for student grievances are found in Title V, Rules on Student Services and Activities, of the university's *Handbook of Operating Procedures*. In attempting to resolve any student grievance regarding grades, evaluations, or other fulfillments of academic responsibility, it is the obligation of the student first to make a serious effort to resolve the matter with the instructor, supervisor, administrator, or committee with whom the grievance originates (hereafter called "the respondent"). Individual faculty members retain primary responsibility for assigning grades and evaluations. If the matter cannot be resolved at that level, the grievance must be submitted in writing to the respondent with a copy of the respondent's School Dean. If the matter is not resolved by the written response provided by the respondent, the student may submit a written appeal to the School Dean. If the grievance is not resolved by the School Dean's decision, the student may make a written appeal to the Dean of Graduate or Undergraduate Education, and the deal will appoint and convene an Academic Appeals Panel. The decision of the Academic Appeals Panel is final. The results of the academic appeals process will be distributed to all involved parties. Copies of these rules and regulations are available to students in the Office of the Dean of Students, where staff members are available to assist students in interpreting the rules and regulations.
Incomplete Grades	As per university policy, incomplete grades will be granted only for work unavoidably missed at the semester's end and only if 70% of the course work has been completed. An incomplete grade must be resolved within eight (8) weeks from the first day of the subsequent long semester. If the required work to complete the course and to remove the incomplete grade is not submitted by the specified deadline, the incomplete grade is changed automatically to a grade of **F**.
Disability Services	The goal of Disability Services is to provide students with disabilities educational opportunities equal to those of their non-disabled peers. Disability Services is located in room 1.610 in the Student Union. Office hours are Monday and Thursday, 8:30 a.m. to 6:30 p.m.; Tuesday and Wednesday, 8:30 a.m. to 7:30 p.m.; and Friday, 8:30 a.m. to 5:30 p.m. The contact information for the Office of Disability Services is: The University of Texas at Dallas, SU 22 PO Box 830688 Richardson, Texas 75083-0688 (972) 883-2098 (voice or TTY) Essentially, the law requires that colleges and universities make those reasonable adjustments necessary to eliminate discrimination on the basis of disability. For example, it may be necessary to remove classroom prohibitions against tape recorders

	or animals (in the case of dog guides) for students who are blind. Occasionally an assignment requirement may be substituted (for example, a research paper versus an oral presentation for a student who is hearing impaired). Classes enrolled students with mobility impairments may have to be rescheduled in accessible facilities. The college or university may need to provide special services such as registration, note-taking, or mobility assistance. It is the student's responsibility to notify his or her professors of the need for such an accommodation. Disability Services provides students with letters to present to faculty members to verify that the student has a disability and needs accommodations. Individuals requiring special accommodation should contact the professor after class or during office hours.
Religious Holy Days	The University of Texas at Dallas will excuse a student from class or other required activities for the travel to and observance of a religious holy day for a religion whose places of worship are exempt from property tax under Section 11.20, Tax Code, Texas Code Annotated. The student is encouraged to notify the instructor or activity sponsor as soon as possible regarding the absence, preferably in advance of the assignment. The student, so excused, will be allowed to take the exam or complete the assignment within a reasonable time after the absence: a period equal to the length of the absence, up to a maximum of one week. A student who notifies the instructor and completes any missed exam or assignment may not be penalized for the absence. A student who fails to complete the exam or assignment within the prescribed period may receive a failing grade for that exam or assignment. If a student or an instructor disagrees about the nature of the absence [i.e., for the purpose of observing a religious holy day] or if there is similar disagreement about whether the student has been given a reasonable time to complete any missed assignments or examinations, either the student or the instructor may request a ruling from the chief executive officer of the institution, or his or her designee. The chief executive officer or designee must take into account the legislative intent of TEC 51.911(b), and the student and instructor will abide by the decision of the chief executive officer or designee.
Off-Campus Instruction and Course Activities	Off-campus, out-of-state, and foreign instruction and activities are subject to state law and University policies and procedures regarding travel and risk-related activities. Information regarding these rules and regulations may be found at http://www.utdallas.edu/BusinessAffairs/Travel_Risk_Activities.htm. Additional information is available from the office of the school dean.

These descriptions and timelines are subject to change at the discretion of the Professor.

Appendix A

LECTURE, LABORATORY, AND EXAMINATION SCHEDULE

(The dates, order of presentation and topical coverage are subject to change. The correspondence between the material covered and the chapters in the text is approximate.)

There are no dates for make up labs.

Date		Lecture Topic	Reference (R&R chapter)
M	01/07/08	Class Organization, course overview Carbonate Problem Excel Practice	 handout
W	01/09/08	Statistics1 – basic ideas HWFG#1 (carbonate) due	2.1 - 2.13
M	01/14/08	Spectroscopy1 - Methods	8.1 – 8.12, 8A
W	01/16/08	Statistics 2	2.16, 3.1 – 3.7
M	01/21/08	University Holiday – Dr. Martin Luther King Day	
W	01/23/08	Chromatography1A - Theory	13.1 – 13.10
M	01/283/08	Chromatography1B - Theory	13.1 – 13.10
W	01/30/08	Chromatography2 - HPLC HWFG#2 (calibration of glassware) due	14
M	02/04/08	Chromatography3 - GC	15
W	02/06/08	Statistics3 HWFG#3 (statistics/HPLC) due	4.6 – 4.7, 5.5 – 5.7
M	02/11/08	Electrochemical methods HWFG#4 (chromatographic theory) due	7.1 – 7.4, 7.7
W	**02/13/08**	**First hour exam**	
M	02/18/08	Spectroscopy 2 – Atomic Absorption	9.1 - 9.9
W	02/20/08	Spectroscopy 3 – Atomic Emission	9.1 – 9.9
M	02/25/08	Spectroscopy 4 – Molecular Absorption	8

W	02/27/08	Spectroscopy 5 – Molecular Emission HWFG#5 (AAS/AES) due	8
M	03/03/08	Spectroscopy 6 – Infrared Absorption	10
W	03/05/08	Spectroscopy7 – Raman HWFG#6 (UV/Fluorescence) due	10
M	03/10/08	Spring Break	
W	03/12/8	Spring Break	
M	03/1708	Mass Spectrometry1 – basics HWFG#7 (FTIR/Raman) due	12
W	03/19/08	Mass Spectrometry2 – proteomics Professor Steven Goodman (1.5 hours)	12.8, handout
M	03/24/08	Chromatography4 – Electroseparations	16
W	03/26/08	Statistics4	2,3,4,5
M	**03/31/08**	**Second hour exam**	
W	04/02/08	Statistics and Noise	17.1 – 17.3, 17.6
M	04/07/08	Magnetic Resonance Imaging HWFG#8 (MS/statistics) due	Handout
W	04/09/08	Radio-analytical Methods	
M	04/14/08	Bulk and Surface Analysis HWFG#9 (Signal-to-Noise) due 9.14 – 9.16	9.10 – 9.12,
W	04/16/08	Microscopy and Structure	handout
M	04/21/08	Problem Solving	in class
W	04/23/08	Problem Solving	in class
M	04/28/08	Problem Solving; Overview Departmental review of class	in class

HWFG#10 is due before starting the HPLC-Simulator lab module.

Th 05/01/08 Final Exam 2pm-5 pm. (covers material from all parts of course)
Please bring any conflicts with this schedule to the attention of the instructor

Lab/Alternate Activity Schedules

Students will work in pairs. 10 lab modules will be available; each module requires one week of lab work (two lab periods).

Laboratory Modules

L1 UV = UV-Vis absorption spectrophotometry
L2 AA = atomic absorption
L3 Fluorescence
L4 PLATES = sampling and use of plate reader (fluorescence based)
L5 Raman = Raman spectrophotometry
L6 GC = gas chromatography
L7 HPLC (software simulator)
Note: **HWFG#10 is due before starting the HPLC-Simulator lab module.**
L8 HPLC = high pressure liquid chromatography
L9 Mass Spectrometry – Proteomics (software)
L10 Sampling (chloride analysis with Ion Selective Electrode)

Definitions

FT/OL = field trip/outside (analytical) lecturer
PAC = process analytical chemistry
LBD = lab book and lab report on module completed the previous week are due at 5 pm on Friday of that week; the report and lab book should be graded over the weekend and returned to you on the following Monday. This procedure allows students eight days to complete a lab report. If students need data from the lab book over the weekend, the TA can Xerox those pages for the student.

Lab/Alternate Activity Schedule
(Assignments for Lab schedule will be made approximately one week prior to the start of labs.)

Date	**Activity**
01/07/08	Continue Excel Practice
01/09/08	Pennies, Pennies

01/14/08	Jerry Hogan	"Analytical Chemistry at TI"
01/16/08	FT/OL	Speaker TBA
01/21/08	University Holiday	
01/23/08	Mike Kozlov	"SEM – Introduction and Tour"
01/28/08	Lab Module#1	Check in
01/30/08	Lab Module#1	
02/04/08	Lab Module#2	
02/06/08	Lab Module#2	LBD
02/11/08	Lab Module#3	
02/13/08	Lab Module#3	LBD
02/17/08	Lab Module#4	
02/20/08	Lab Module#4	LBD
02/25/08	PAC#1 (lecture and team time)	
02/27/08	PAC#2 (lecture and team time)	LBD
03/05/08	PAC#3 (lecture and team time)	
03/05/08	PAC#4 (presentations)	
03/10/08	Spring Break	
03/12/08	Spring Break	
03/17/08	Lab Module#5	
03/19/08	Lab Module#5	
03/24/08	Lab Module#6	
03/26/08	Lab Module#6	LBD
03/31/08	Lab Module#7	

04/02/08	Lab Module#7	LBD	
04/07/08	Lab Module#8		
04/09/08	Lab Module#8	LBD	
04/14/08	Lab Module#9		
04/16/08	Lab Module#9	LBD	
04/21/08	Lab Module#10		
04/23/08	Lab Module#10	LBD	Check out
05/01/08 (Thursday)		LBD	

Appendix B

GRADING The course grade will be based on two in-class exams, all laboratory/alternate activity work, a final exam, and team effectiveness. However, as described in the following paragraphs, homework submitted for grading may also affect the grading.

Homework

The instructor will designate certain problems in the textbook as "particularly relevant to the concept" (PRC). Students are strongly advised to make sure that they are able to do these problems; since they are substantial clues to what the instructor thinks is important, and similar approaches and concepts are likely to appear on the exams. However, the PRC problems will not be accepted for grading. Additional homework problems, designated HWFG (**H**ome**W**ork **F**or **G**rading) will be assigned (10 or so over the whole course), and students have the option of whether to submit these problems for grading. In this class, students are encouraged to work together on the homework, with the understanding that anyone turning in a problem for grading has mastered all the concepts in the problem (rather than just copying someone else's work). Homework will not be accepted for grading if it is submitted after the ATNC ("after this, no credit") date. However, students are strongly encouraged to submit homework at the stated due dates, so that they stay abreast of the concepts. **If a student chooses to submit homework for grading, the cumulative homework percentage grade multiplied by 1.25 may, at the student's option, replace the score on one of the in class exams**.

Exams

Except in extraordinary circumstances, make-up exams will not be given. The points for a missed exam will be added to the points available on subsequent exam(s); this option may be invoked only once during the semester.

Each student may bring a single 5" x 8" card, with any material hand written on the card, to each exam. Photoreduction or other methods of increasing the density of material on the card are forbidden. Therefore, in preparation for the exams, students should understand that simple memorization will be of little value. The exams are much more likely to **emphasize reasoning and problem solving skills** than memorization.

The instructor has a strong preference for exam problems of the following types:

1) "Given this data, calculate the concentration of …"
2) "For the analysis of …., what techniques are most appropriate?
3) "Show that you understand both the construction the instrument and the physical principles underlying the measurement."

Laboratory/Alternate Activity

There are approximately 25 lab/alternate activity periods. A student can earn 16 points in each such period.

Teams

During the laboratory portion of the course, the team tasks are to meet once a week for at least 15 minutes, to try to raise the lab grade for every team member, and to submit a one page report on the team activities each week. For students in the alternate activities portion of the course, tasks and reports will be assigned to the teams, as appropriate.

I need some relief…

This is a demanding course, and you will need some relief, particularly towards the end. Each student has two "relief chits", which he/she may use to opt out of an HWFG assignment or a lab period and be awarded the average of their other grades for the HWFG's or labs, respectively. Two chits are required to opt out of an entire lab module, and the chits may not be used to opt out of the HPLC or GC labs. In order to use the chits to opt out of a lab, the partner must concur. Since the chits are intended to relieve workload during the course, they may not be used in place of work that has already been done, i.e., "to drop a low grade at the end of course."

Overall grading

2 hour exams @ 100 points	= 200 points
1 final exam @ 150 points	= 150 points
Laboratory/Alternate Activity work 25 x16	= 400 points
Team effectiveness @ 50 points	= 50 points
Total	**800 points**

Over the past few years, the breaks between A- and B+, and B- and C+ have been at approximately 90% and 80%, respectively. These numbers depend on a variety of factors such as difficulty of exams, availability of equipment, etc. and are subject to change.