



Course CHEM 3472-001
Instrumental Analysis
Professor Dr. Jerry Hogan
Term Fall 2007
Lecture T-Th 1:00-2:15 BE3.102
Meetings Laboratory T-Th 2:15-5:15 BE3.314

Professor's Contact Information

Office Phone TBA (not yet assigned)
Other Phone None
Office Location TBA (not yet assigned)
Email Address jhog@ti.com
Office Hours To be determined at first class meeting
WebCT will be used routinely for announcements, posting of course materials, etc. NOTE: The instructor will not read email sent within WebCT; you must use the email address given above.

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

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

Learning Outcomes

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

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

Required Texts & Materials

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 Assignments	None; syllabus is complete
Class Attendance	Used in determination of whether mercy is justified
Classroom Citizenship	Highest level is expected
Field Trip Policies	<p><i>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 the website address</i></p> <p>http://www.utdallas.edu/BusinessAffairs/Travel_Risk_Activities.htm. Additional information is available from the office of the school dean. Below is a description of any travel and/or risk-related activity associated with this course.</p> <p>No off campus trips</p>
Technical Support	If you experience any problems with your UTD account you may send an email to: assist@utdallas.edu or call the UTD Computer Helpdesk at 972-883-2911.
Student Conduct and Discipline	<p>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 printed publication, <i>A to Z Guide</i>, which is provided to all registered students each academic year.</p> <p>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 <i>Rules and Regulations, Series 50000, Board of Regents, The University of Texas System</i>, and in Title V, Rules on Student Services and Activities of the university's <i>Handbook of Operating Procedures</i>. 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) and online at http://www.utdallas.edu/judicialaffairs/UTDJudicialAffairs-HOPV.html</p> <p>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.</p>
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.

	<p>Scholastic Dishonesty, any student who commits an act of scholastic dishonesty is subject to discipline. Scholastic dishonesty includes but is not limited to cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts.</p> <p>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.</p>
Copyright Notice	<p>The copyright law of the United States (Title 17, United States Code) governs the making of photocopies or other reproductions of copyrighted materials, including music and software. Copying, displaying, reproducing, or distributing copyrighted works may infringe the copyright owner's rights and such infringement is subject to appropriate disciplinary action as well as criminal penalties provided by federal law. Usage of such material is only appropriate when that usage constitutes "fair use" under the Copyright Act. As a UT Dallas student, you are required to follow the institution's copyright policy (Policy Memorandum 84-I.3-46). For more information about the fair use exemption, see http://www.utsystem.edu/ogc/intellectualproperty/copypol2.htm</p>
Email Use	<p>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</p>
Withdrawal from Class	<p>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.</p>
Student Grievance Procedures	<p>Procedures for student grievances are found in Title V, Rules on Student Services and Activities, of the university's <i>Handbook of Operating Procedures</i>.</p> <p>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</p>

	<p>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 dean 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.</p> <p>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.</p>
<p>Incomplete Grades</p>	<p>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.</p>
<p>Disability Services</p>	<p>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.</p> <p>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) disabilityservice@utdallas.edu</p> <p>If you anticipate issues related to the format or requirements of this course, please meet with the Coordinator of Disability Services. The Coordinator is available to discuss ways to ensure your full participation in the course. If you determine that formal, disability-related accommodations are necessary, it is very important that you be registered with Disability Services to notify them of your eligibility for reasonable accommodations. Disability Services can then plan how best to coordinate your accommodations.</p> <p>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.</p>
<p>Religious Holy Days</p>	<p>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.</p> <p>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</p>

	<p>period may receive a failing grade for that exam or assignment.</p> <p>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.</p>
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All 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.

<u>Date</u>	<u>Lecture Topic</u>	<u>Reference</u> (R&R chapter)
Th 08/16/07	Class Organization, course overview Carbonate Problem	
T 08/21/07	(L1) Excel practice (L2) Statistics1 – basic ideas HWFG#1 (carbonate) due	handout 2.1 - 2.13
Th 08/23/07	(L1) Spectroscopy1 - Methods (L2) Statistics 2	8.1 – 8.12, 8A 2.16, 3.1 – 3.7
T 08/28/07	Chromatography1 - Theory	13.1 – 13.10
Th 08/30/07	Chromatography2 - HPLC HWFG#2 (calibration of glassware) due	14
T 09/04/07	Chromatography3 - GC	15
Th 09/06/07	Statistics3 HWFG#3 (statistics/HPLC) due	4.6 – 4.7, 5.5 – 5.7
T 09/11/07	Statistics4	2, 3, 4, 5

Th	09/13/07	Electrochemical methods HWFG#4 (chromatographic theory) due	7.1 – 7.4, 7.7
T	09/18/07	First hour exam	
Th	09/20/07	Spectroscopy 2 – Atomic Absorption	9.1 - 9.9
T	09/25/07	Spectroscopy 3 – Atomic Emission	9.1 – 9.9
Th	09/27/07	Spectroscopy 4 – Molecular Absorption	8
T	10/02/07	Spectroscopy 5 – Molecular Emission HWFG#5 (AAS/AES) due	8
Th	10/04/07	Spectroscopy 6 – Infrared Absorption	10
T	10/09/07	Spectroscopy7 – Raman HWFG#6 (UV/Fluorescence) due	10
Th	10/11/07	Mass Spectrometry1 – basics HWFG#7 (FTIR/Raman) due	12
T	10/16/07	Mass Spectrometry2 – proteomics Professor Steven Goodman (1.5 hours)	12.8, handout
Th	10/18/07	Chromatography4 – Electroseparations	16
T	10/23/07	Second hour exam	
Th	10/25/07	Statistics and Noise	17.1 – 17.3, 17.6
T	10/30/07	Magnetic Resonance Imaging HWFG#8 (MS/statistics) due	Handout
Th	11/01/07	Radio-analytical Methods	
T	11/06/07	Bulk and Surface Analysis HWFG#9 (Signal-to-Noise) due 9.14 – 9.16	9.10 – 9.12,
Th	11/08/07	Microscopy and Structure	handout
T	11/13/07	Problem Solving	in class
Th	11/15/07	Problem Solving	in class

T 11/20/07 Problem Solving; in class
Overview
Departmental review of class

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

Th 11/29/07 Final Exam 11am-2 pm. (covers material from all parts of course)

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.

TR = a team report of approximately one page is due via WebCT no later than 5 pm on Friday of that week. TRA means that the team report must include an assessment of team performance according to the definitions in Teams-Self Assessment.pdf

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

Date	Activity	
08/21/07	FT/OL#1	“Cocaine and the Drug Enforcement Agency” Mr. Cornell Wilson, DEA
08/21/07	FT/OL#2	“SEM/EDX” Dr. Mikhail Koslov, UTD
08/23/07	FT/OL#3	“Pennies, Pennies”
08/28/07	Lab Module#1	Check in
08/30/07	Lab Module#1	TR
09/04/07	Lab Module#2	
09/06/07	Lab Module#2	LBD, TR
09/11/07	Lab Module#3	
09/13/07	Lab Module#3	LBD, TR
09/18/07	Lab Module#4	
09/20/07	Lab Module#4	LBD, TRA
09/25/07	PAC#1 (lecture and team time)	
09/27/07	PAC#2 (lecture and team time)	LBD
10/02/07	PAC#3 (lecture and team time)	
10/04/07	PAC#4 (presentations)	TRA
10/09/07	Lab Module#5	
10/11/07	Lab Module#5	TR
10/16/07	Lab Module#6	

10/18/07	Lab Module#6	LBD, TR	
10/23/07	Lab Module#7		
10/25/07	Lab Module#7	LBD, TR	
10/30/07	Lab Module#8		
11/01/07	Lab Module#8	LBD, TR	
11/06/07	Lab Module#9		
11/08/07	Lab Module#9	LBD, TR	
11/13/07	Lab Module#10		
11/15/07	Lab Module#10	LBD, TRA	Check out
11/26/07 (Monday)		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**radings) 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, due by Friday 5 pm of that week.. The teams must actually meet; failure to do so will result in points being deducted. For students in the alternate activities portion of the course, tasks and reports will be assigned to the teams, as appropriate. Twelve team reports are required (one for each lab module plus two for the PAC weeks)

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 points	= 400 points
Team effectiveness 11 x 5 points	= 55 points

Total **805 points**

Note: The total number of points may vary slightly, primarily because the Laboratory/Alternative Activity work varies, and because of the inclusion of HWFG adjustments.

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.