INSTRUMENTAL ANALYSIS W/ LAB
CHEM 4240 FALL 2008

LECTURE HOURS: Tuesday and Thursday @ 9:25 - 10:40 am
CLASS ROOM: NCF140
CREDIT: 4 Hrs
INSTRUCTOR: Guangdi Wang **OFFICE**: NCF 339, Tel: 520-5076, gwang@xula.edu
OFFICE HOURS: **T, Th: 8:45~9:25 am; 10:40~12:00 pm W: 10:00~12:00 pm**

REQUIRED TEXT: "Principles of Instrumental Analysis" by Skoog et al., 6th edition, Saunders Publishing: New York, 2006.

SUPPLEMENTAL TEXT: "Contemporary Instrumental Analysis" by K. Robinson and J. Robinson, Prentice Hall, New Jersey, 1999.

COURSE DESCRIPTION/OBJECTIVES: Theory, instrumentation, and applications of modern instrumental methods of chemical analysis. The course will cover topics in spectroscopic (including absorption and emission spectroscopies, nuclear magnetic resonance, and mass spectrometry), electrochemical (potentiometry and voltammetry), and chromatographic (GC, HPLC, and CE) techniques. In addition, each student will conduct an independent literature report on one of the instrumental techniques during the semester.

PREREQUISITE: CHEM 3210/3210LB

HOMEWORK: Homework will be assigned for each section covered in the textbook. The homework problems will reflect the types of problems a student should be able to solve for the exams. A solution key will be posted outside my office one week before an exam. Even though the homework will not be collected and graded, you are expected to work all the problems.

LITERATURE REPORT: Each student will choose one topic in instrumental methods of analysis and write a literature report on the topic by the end of the semester.

QUIZZ: Several unannounced quizzes will be given through the whole semester, each worth 10 points.

GRADING: There will be two exams each worth 100 points during the semester and one comprehensive final exam worth 100 points. No make-up exams will be given for any reason. If a student misses one exam for a legitimate reason, the final will be counted as 200 points to compensate for that. A student missing more than one exam must either withdraw from or fail the course. The midterm grade will be calculated based on the average score on the first exam.

Grades for the lecture part will be assigned as follows:

Exams	100x2 =	200
Quizzes	10 x 5 =	50
Literature report		50
Final		100
Total		400 pts

90-100%	A
80-89%	B
70-79%	C
60-69%	D
0-59%	F

Tentative Course Schedule:

Dates	Topics
8/26	Introduction to Instrumental Analysis and Spectrometric Methods (Chapter 6)
8/28	Components of Optical Instruments (Chapter 7)
9/2	Atomic Spectroscopy (Chapter 8)
9/4	Atomic Absorption Spectroscopy (Chapter 9)
9/9	Atomic Emission Spectroscopy (Chapter 10) & Introduction to Ultraviolet/Visible Molecular Absorption Spectroscopy (Chapter 13)
9/11	Introduction to Ultraviolet/Visible Molecular Absorption Spectroscopy (Chapter 13)
9/16 – 9/18	Applications of UV-Vis Spectroscopy (Chapter 14)
9/23 – 9/30	Infrared absorption spectroscopy (Chapter 16 & 17)
10/2	**Exam 1**
10/7-10/16	NMR Spectroscopy (Chapter 19)
10/16-10/28	Mass Spectrometry (Chapter 20)
10/30-11/4	Introduction to Chromatography, Gas Chromatography (Chapter 26&27)
11/6-11/11	Liquid Chromatography (Chapter 28)
11/13	**Exam 2**
11/18	Introduction to Electrochemical Methods (Chapter 22)
11/20	Potentiometric Methods (Chapter 23)
11/25-12/2	Potentiometric Methods and Voltammetry (Chapter 23&25)
12/4 – 12/9	Presentations

LAB PART OF INSTRUMENTAL METHODS OF ANALYSIS FALL 2008

TIME: Tuesday 1:15-5:05 pm

PLACE: NCF RM 307 & 320

TEXT: Instrumental Methods of Analysis Lab Manual (Wang)

COURSE DESCRIPTION: Each student will conduct seven to eight experiments that are designed to provide the students with hands-on experience in a wide variety of analytical instrumentation. Modern instrumental methods including UV/VIS, IR, MS, NMR, GC, LC, and CV will be employed. The students will learn instrument operation, data acquisition, and data analyses from each experiment.

LAB NOTEBOOKS: Each student is required to keep a lab notebook. The following guidelines should be observed in keeping your lab notebook:

1. Do not rewrite a procedure from the text or a handout. But do record any variations in procedure which may have been used. A two to three sentence description of the experiment should be given at the beginning of each experiment.
2. Record all data directly into the notebook. Do not erase mistakes, simply draw a line through them and correct them.
3. Perform all calculations in the notebook.

LAB REPORTS: Each student writes a full lab report for each experiment performed. The lab reports are due a week after the experiments are finished. A penalty of two points per day will be assessed if the report is turned in late. The lab reports must be typed; handwritten reports will not be accepted. The lab reports should follow the format given below.

1. Introduction: brief description of the technique and how it is being applied.	5 pts
2. Experimental: brief description of the instrument, chemicals, and experimental procedures employed in the lab.	5 pts
3. Results: raw data, calculations or spectroscopic assignments	25 pts
4. Discussion: error analysis and any possible conclusions	15 pts
Total	50 pts

QUIZZES AND EXAMS: A 10-pt lab quiz will be given at the beginning of each experiment. The quiz will be designed to determine if a student is adequately prepared for the lab for that day. There will be no midterm exam; midterm grades will be calculated from the lab reports and quizzes turned in up to that point. There will be a comprehensive final exam on **Tuesday, December 2, 2008 at 1:15 pm**

Cheating: For most of the experiments in this course the students will be working in pairs. The lab reports, however, are to be written independently by each student. Any evidence of plagiarism-either from another student or from a literature source-will result in a grade of zero on that lab report. The same policy will hold for the quizzes and the final exam.

SAFETY: Safety is extremely important when working in a laboratory. Each experiment lists safety precautions that should be taken during that lab. Additionally, students are required to wear safety goggles and a lab coat at all times during the lab. Failure to do so, or failure to follow any of the safety guidelines for a given experiment, will result in the student being kicked out of the lab for the rest of the day.

GRADING: Lab grades will be assigned as follows:

Lab reports 7 x (50)	350	90-100%	A
Quizzes 6 x (10)	60	80-89%	B
Final Exam	100	70-79%	C
	510 total	60-60%	D
		0-59%	F

COURSE SCHEDULE

Dates	Experiment
8/26	Introduction, assignment of groups, tour of instrumentation
9/2	Absorption Spectrometry Tutorial (UV, IR, NMR)
9/9-9/30	Set 1
10/7	MS and Chromatography tutorial
10/14 -10/28	Set 2
11/4	Tutorial for independent project
11/11 – 11/25	Set 3 (Independent Projects)
12/2	**Final Exam**

Set 1:
1) Determination of pKa of an indicator
2) Infrared Spectra of aldehydes and ketones
3) NMR - keto-enol tautomerization

Set 2:
1) Determination of the molecular weights of Cytochrome C and Myoglobin by Electrospray Ionization Mass Spectrometry
2) GC-MS separation and identification of polycyclic aromatic hydrocarbons (PAHs)
3) HPLC determination of caffeine in beverages

Set 3: Independent Project (Examples include but are not limited to: Analysis of over the counter drugs based on a form of chromatography; Environmental analysis; Food analysis, etc). Each group should come to me as early as possible (no later than **October 7** to discuss the feasibility and technical aspects of the project.

Overall Course Grading will be calculated as follows:

Lab: 25% Lecture: 75% Total: 100%