CHEMISTRY 361
Analytical Instrumentation
Syllabus Spring 2008

Professor: Dr. Evans
E-mail: jason.evans@umb.edu
Telephone: 617-287-6149
Office hours: TH 8:30-10 or by appointment
Office: Science 1-084
Lecture: Tu Th 10-11:15 Chemistry Conference Room
Lab: Th 2-5

Objective: This course provides a survey of the different types of instrumentation that is in the chemist's tool box. We will stress advantages and disadvantages and develop the insight that is necessary to choose the right tool for the right problem. We will use several of these tools in the laboratory portion of the course. The course can be broken down into several components.

1. brief lectures on a given instrument
2. current literature
3. four, 4-week lab projects

Course Structure:

Tuesday will be reserved for lectures. The lectures are going to cover the basics of the instrumental method that is the focus of that week's literature assignment. Thursdays will be reserved for literature assignments, Powerpoint presentations, laboratory projects, and discussion of lab results.

Literature Assignments

On five different Thursdays throughout the semester (see below for schedule) you will receive an article from the current literature and an assignment that will consist of a list of questions pertaining to the article. The assignment will be due the following Thursday, and we will discuss the article in class after the assignment has been turned in. **Late assignments will not be accepted!**

Semester Project

For a semester-long project each of you will choose an article from the literature on a new or improved instrumental technique. You will be required to delve into the references in this article for background information, and present a summary of the technique (power point presentation) to the class. These presentations will be held on Thursdays. During the first week of class each of you will sign up for a particular slot during the second half of the semester. You will have various deadlines throughout the semester related to this project (see below for details)

Lab

As mentioned above the lab will be project-based and will require you to work efficiently as part of a team. The team will consist of 3-4 members. You will be given a project. The goals of the project will be explicitly stated. You will also be given some pertinent articles from the literature. You will be given this information one week in advance of the first lab period for the given project. During the lab period on *week 1* you will have to work together to hash out a "plan of attack", basically an outline of how you plan to carry out the project. I will serve as a guide to your team. This outline is to be formally documented and presented to me on the following Tuesday *(one per group)*. Any lab work that needs to be performed in preparation for the following week will also be tackled during the first week of lab. You will also use this lab period to evaluate the data collected the prior week for the previous project, and to determine if any further experimentation is needed.

Weeks 2 and 3 will be used to perform the necessary experiments to complete the project.

You will use the lab period of week 4 to evaluate the data collected the prior week for the previous project, and to determine if any further experimentation is needed. You will also be given your next project, and will have to design the experiments that need to be performed for this next project (the "plan of attack" that is due the following Tuesday. So, in other words, week 1 of the next project overlaps with week 4 of the current project.

However, due to the fact that I will be unavailable for class the week after Spring break, Project 3 will only consist of three weeks. The third week will be a wrap up week and will overlap with week 1 of Project 4.

Reports are due Tuesday after week 4. They will be graded and returned by that Thursday. Lab reports are to be written up in the style of an Analytical Chemistry journal article (abstract, introduction, ***theory and experimental***, results, conclusions, references). *It is imperative that you start working on the introduction, and experimental sections during week 2 of the project. You will be overwhelmed if you wait until the weekend before the lab report is due.* Lab reports for the first and third project must be revised. The revisions are due the following Thursday. The final grade for the first and third lab report will consist of an average grade between the original and revision.

Text: Principles of Instrumental Analysis, 6th Edition by Skoog, Holler, and Nieman

Grading:

4 lab reports and one revision, 100 pts each, 36 %
4 experimental outlines, 25 pts each, 7 %
5 literature assignments, 50 pts each, 18 %
1 literature presentations, 200 pts, 14 %
Participation (attendance/group and class discussions), 150 pts, 11 %
Mid term Exam, 100 pts, 7 %
Final Exam, 100 pts, 7 %

Grading Scale:

Total points	**Grade**	**Total points**	**Grade**
1110-1200	A (92.5)	850-914	C (70.8)
1050-1109	A- (87.5)	810-849	C- (67.5)
1020-1049	B+ (85.0)	770-809	D+ (64.2)
980-1019	B (81.7)	720-769	D (60.0)
940-979	B- (78.3)	660-719	D- (55.0)
915-939	C+ (76.3)	< 659	F

No late assignments will be accepted!!!!!

Attendance: You are expected to attend all lectures and lab periods. Chronic class skipping and tartiness will be reflected in your class participation grade.

Academic dishonesty: For much of the semester you will be working in teams, and team work is encouraged and expected. However, all written lab reports are to be the work of the individual. If I receive lab reports from team members that look identical, both individuals will receive a zero.

Lecture Schedule:

Date	Chapter	Topic
Jan 29/31	Ch 6-8,13-14	Spectroscopy overview, UV-vis
Feb 5/7	Ch 15	Molecular fluorescence
Feb 12/14	Ch 9,10	AA, atomic emission
Feb 19/21		Lasers and Fourier transform
Feb 26/Feb 28	Ch 16,17	Fourier transform and FTIR
Mar 4/6	Ch 19	FT-IR and NMR
Mar 11/13	Ch 19, handouts	NMR
Mar 25/27	Ch 18	Raman Spectroscopy
Apr 1/3	Ch 20	Mass Spec (EI, CI)
Apr 8/10	Ch 20	Mass (ESI, MALDI)
Apr 15/17	Ch 26,27	Separations, GC
Apr 22/24	Ch 28	HPLC
Apr 29/May 1	Ch 30	CE
May 6/8	Ch 21	Surface techniques;AFM, SEM, aujer, SIMS
May 13		Wrap up

Lab Projects:

Project 1: Analysis of Sun Tan Lotions by Reversed-phase HPLC/Ultraviolet Spectroscopy

Project 2: Analysis of Plastics by Attenuated Total Reflectance/Fourier Transform Infrared Spectroscopy

Project 3: Analysis of Vegetable Oils by Reversed Phase HPLC/Electrospray/MS-MS

Project 4: Analysis of gasoline by GC/MS

Lab Schedule and assignment due dates:

Date	
Jan 29/Jan 31 (week 1, 1st module)	Receive Project 1
Feb 5	Outline 1 is due!
Feb 14	Perform experiment Lit. Assign. 1 is due
Feb 21	Evaluation of data Additional experiments Receive and game plan for Project 2
Feb 26	Outline 2 is due! Report 1 is due!
Feb 28 and Mar 6 (start 2nd module)	Perform experiment Lit. Assign. 2 is due (28th)
Mar 13	Receive and game plan project 3 Guest Lecturer.
Mar 27	Class cancelled
Mar 29	Report 2 is due! Outline 3 is due! Guest lecturer Midterm Exam during lab period
Apr 3 and Apr 10 (start 3rd module)	Perform experiments for project 3 Receive project 4 Lit. Assign. 3 is due on the 10th
Apr 17	Evaluation of data Additional experiments for Project 3 Receive and game plan for Project 4
April 22	Report 3 is due! Outline 4 is due!
Apr 24 and May 1 (start 4th module)	Perform experiment for project 4 Lit. Assign. 4 is due on April 24th! Lab report revision id due!
May 8	Evaluation of data Additional experiments Literature Assign. 5 is due!
May 15	Report 4 is due!
Finals Week	Final Exam

Timeline for Semester-long Project

January 31th	Begin to peruse the most current issues of ASC type journals to find exciting topics that you are motivated to explore further in great detail.
February 19th	Submit a primary article from the recent literature that will be the focus of your literature research and project (25 pts)
February 26th	Projects will be officially approved or you must redevelop your ideas and submit a new idea the following week
March 4st	Assign dates for Powerpoint Presentation
March 11th	Obtain all of the pertinent papers to your topic (secondary references from primary article, PubMED search, inter-library loan, trip to MIT). Submit a bibliography, and visit my office with your binder full of papers for my examination (25 pts). For a guideline, there should be about 15-25 articles in your binder.
April 3rd	Submit a detailed outline of your PowerPoint Presentation (50 pts). Schedule a meeting with meet with me to discuss your outline and to get help in structuring your presentation.
April-May	Give PowerPoint Presentation to class (100 pts)