

Chemistry 314 Instrumental Analysis
Spring 2018
Professor Alanah Fitch
Room 418, 83119, afitch@luc.edu
Office Hours: Wed 2-4 p.m.

Description:

This is the capstone, writing intensive, service learning class for chemistry majors. This class is intended to integrate all core concepts from previous classes while simultaneously providing hands-on experience on common chemical instrumentation. The class can best be described as a “finishing class”. Students leaving this class will be able to successfully survive a job interview for an industrial position and will be able to describe a research project for a graduate or medical school interview. The first 2/3 of the class are devoted to providing *analytical thinking* and *professional* training so that the student may solve a field environmental question related to lead with full quality control and assignment of uncertainty and validity to those results, as prepared by the student in the final 1/3 of the semester.

Textbooks:

Optional, in the years that I require the textbook students tell me that they didn't need it

In the years that I make the textbook optional students tell me that they did need it.

You are now within 6 months of being a certified professional. Use your own discretion:

1. Skoog Holler and Crouch: Principles of Instrumental Analysis
2. Web source (exceptionally good): Analytical Digital Sciences Library
3. Very Useful: Robert de Levie: How to Use Excel in Analytical Chemistry or equivalent text.

Materials for Lecture and Lab

Lecture material made available as we proceed through the labs.

The “lecture” section is designed to move along as closely as possible with the work in the lab. Time is allotted in each lecture section to discuss concepts and data obtained within the lab, as a result each student is expected to come to class prepared to ask questions and discuss the material from lab. Students will be asked to present data as they have obtained it.

Materials and Equipment to Be Supplied by the Student and brought to all classes

- calculator
- Laptop computer with a database, preferably Excel (available through Open Office)

Responsibility of Students for Preparation and Cleanliness

- Students are expected to arrive with a working knowledge of the content of the assigned lab and be ready to begin promptly in order to complete the various tasks.
- Grades can drop if laboratory cleanliness is not adhered to. Each group is responsible for the cleaning of all lab ware used and to return the equipment to the appropriate space. If this becomes an issue the groups, semester grade may be lowered by a full grade.

Groupings

In order to allow each student hands on access to the equipment each lab is split into 2 to 3 groups, each group having no more than 3 participants. The groups will follow DIFFERENT schedules throughout the semester as indicated on the next page. 2 labs deal with manipulation of data.

Working in groups is not easy. We expect you to make an honest effort to evaluate your own contribution and that of your partners to the group. At week three you will be given an opportunity to restructure. If an individual performs so poorly within a group that they are not “desirable” they will be expected to complete the work on their own with no decrease in the amount of work.

Readings

You may choose to read web based materials on the topics listed in addition to or instead of the material provided on Sakai

| Point Distribution | | | Grading Scale | | | |
|-----------------------|---------------|------------|--------------------------------|--------|------|----|
| Rubric | points | % of grade | Grade | points | % | |
| Resume | 50 | 2 | A | 2300 | 92 | |
| Labs | 6 lab reports | 600 | 24 | A- | 2250 | 90 |
| | 2 summaries | 200 | 8 | B+ | 2200 | 88 |
| | 1 ppt | 150 | 6 | B | 2050 | 82 |
| Labs/Writing 40% | 1000 | 40 | B- | 2000 | 80 | |
| Exams # | Exam 1 | 300 | 12 | C+ | 1950 | 78 |
| | Exam 2 | 300 | 12 | C | 1800 | 72 |
| | Exam 3 | 300 | 12 | C- | 1750 | 70 |
| Final | video/ppt | 500 | 20 | | | |
| Content Demonstration | 1400 | 56 | # Takehome so no makeups | | | |
| clean up* | 100 | 4 | * failure to participate drops | | | |
| Total | 2500 | 100 | grade one level | | | |

- 600 points or 24% of your grade is in regular lab reports. They are turned in at the beginning of the next lab, a provisional grade to you the subsequent week,

with 1 additional week to revise. This occurs for the first 4 lab reports. The last two full forms receive a final grade in the first submission.

| Semester week | Week starting on | Exams Mon due on Fri | Class schedule 1:35-1:25 FH 105 | Lab Schedule (subject to change on instrumental quirks) * indicates a lab report # indicates ppt % indicates a summary (summary consists critical calibration) | | | | | |
|---------------|--------------------|------------------------|---|---|----------|----------|----------------------------------|----------|----------|
| 1 | 15-Jan | | Communication, Confidence, Statistics, Digestions | No Labs: 1st draft Resume Writing Due Friday | | | | | |
| 2 | 22-Jan | | Information Processing: Noise in Instrum; Enhancement of Data | Lab: Statistics * Meet in Conference Room FH129 | | | | | |
| 3 | 29-Jan | | Intro to Optics | Lab: Information Processing * Meet in Conference Room FH129 | | | | | |
| | | | | Labs: Meet 15-30 minutes FH 129 and then migrate to PChem FH 315 | | | | | |
| | | | | Monday Lab | | | Friday Lab | | |
| | | | | Group 1 | Group 2 | Group 3 | Group 1 | Group 2 | Group 3 |
| 4 | 5-Feb | Exam 1 Takehome Jan 20 | Intro to Optics | UV-Vis # | FTIR # | Raman # | UV-Vis # | FTIR # | Raman # |
| 5 | 12-Feb | | Group ppt class reports # | FTIR * | Raman * | UV-Vis * | FTIR * | Raman * | UV-Vis * |
| 6 | 19-Feb | | Molecular Spectroscopy FTIR | Raman * | UV-Vis * | FTIR * | Raman * | UV-Vis * | FTIR * |
| 7 | 26-Feb | | Molecular Spectroscopy Raman | IC * | FAA % | ASV % | IC * | FAA % | ASV % |
| 8 | 5-Mar | | Spring Break | | | | | | |
| 9 | 12-Mar | Exam 2 Takehome Mar 6 | Intro to Separations | FAA % | ASV % | IC * | FAA % | ASV % | IC * |
| 10 | 19-Mar | | IC | ASV % | IC * | FAA % | ASV % | IC * | FAA % |
| | | | | Mar 24 Sat: Soil Sampling Lawndale | | | | | |
| | | | | Mar 25 Sun: Soil Sampling Lawndale | | | | | |
| 11 | 26-Mar | | ASV | Lawndale Soil Drop Off | | | Lawndale Soil digestion | | |
| 12 | 2-Apr | | FAA | Lawndale Soil analysis | | | Lawndale Soil Analysis | | |
| 13 | 9-Apr | Exam 3 Takehome Apr 10 | Programmed GC | Easter Break | | | | | |
| 14 | 17-Apr | | MS, GCMS | Lawndale Soil analysis | | | Lawndale Soil analysis | | |
| 15 | 24-Apr | | Wrap Up | Clean up 2nd draft resume | | | Clean up 2nd draft resume | | |
| 16 | Fri May 4: 9-11 am | | Final | Class Lawndale Legal Presentation or Video | | | | | |

This is the schedule for both lab and “lecture”. You will note that we cannot always be in sync for each working group for lab. Therefore there will be times when you must read ahead.

- As in real life, we work with instrumentation and that instrumentation does not always obey commands to “sit, work, and stay”. There may be adjustments to this schedule.
- We will be doing a in community service project that will take up the final weeks of the semester. You have been allotted 4 weeks to complete the project. You will, however, provide reports prior to that work about the planning that has taken place to
 - Sample the soils
 - What type of sample prep you decide on
 - Quality Control constraints added

- Anticipated Limit of Detection required to meet regulatory limits
 - Choice of instrumentation based on Figures of Merit
- Your choices will affect the amount of time you need to spend in lab. The lab time is flexible and will NOT be constrained to the lab period only.