

Chemistry 5650
Instrumental Analysis Laboratory
Spring 2008

Meet: TH 8:30 – 11:20 am

Room: ML – 362

Instructor: Stephen E. Bialkowski

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Office Hours: TH 9:30-11:20 pm

Text: Laboratory procedures will be handed out to students one week or more prior to the experiments. A bound laboratory notebook and safety glasses are required. Some labs are listed on: <http://www.chem.usu.edu/~sbialkow/Courses/5650/Chem5650.html>

Philosophy: Chemistry 5650 is a lab designed to increase the student's understanding of chemical instrumentation. You will be able to perform up to 8 in the 15 week semester. Laboratories will require that you read and analyze instrument manuals. You may be required to operate the instrument with little or no training.

Operation: The class will be divided into teams of two or three. Every team will do the first two experiments. The team must also decide which other experiments they want to do from those currently written up or under development. Due to a lack of duplicate equipment, experiments will be rotated throughout the quarter, except that laboratory-1; Electrical Measurements is a prerequisite for laboratory-2; Operational Amplifiers. Since many of the experiments are performed before they are covered in the lecture, it is imperative that the experimental procedure and the corresponding material in the Chem 5640 text be read before conducting the experiment.

All students will also participate in the NMR demonstration and experiment.

The last experiment will be a special project that the group decides to do. For this experiment, students will design their own experimental procedure. The project must be discussed with me prior to approval. The approved project must be outlined on paper. Most students will choose this as the subject of their formal report.

Laboratory Reports: Written reports are required for each experiment. Your entire grade depends upon these reports. In addition to the regular reports, you will turn in one "formal" report. All reports will consist of the following items:

1. Brief introduction
2. Theory of the scientific principles involved, and more importantly, theory of the instrument
3. Brief outline of experimental details
4. Data, results, tables, etc.
5. Analysis/Conclusions
6. Questions (if applicable)
7. References

The formal report will be graded upon the above criteria as well as its English grammar, style, clarity, etc. The non-formal reports are worth 20 points and the formal report is worth 60 points, making a total of 200 points possible. Informal reports are to be turned in no later than **one week** after the experiment has been completed (**two** weeks for the formal report). A penalty of 1% per day late will be assessed for late work. Don't get behind! The last day of classes is the last day to hand in reports.

Grades: Grades will be based on your laboratory reports. The seven informal reports are worth 20 points each for a total of 140 points. The formal report, in which you will go more into detail regarding the theory of operation, etc., is worth 60 points (three times a regular report). A percentile score will be derived from the 200 total points.

Learning Objectives:

- Demonstrate knowledge of sampling methods for all states of matter
 - Assess sources of error in chemical and instrumental analysis and account for errors in data analysis
 - Recognize interferences in chemical and instrumental analysis
 - Comprehend the concept of and perform instrument and method calibration
 - Apply and assess concepts of availability and evaluation of analytical standards and formulate standardization methodology
 - Integrate a fundamental understanding of the physics principles of and instrumentation for atomic, molecular, and mass spectrometry, magnetic resonance spectrometry, chromatography and other methods of separation, electro-analytical methods, and thermal methods for chemical analysis
 - Apply theory and operational principles of analytical instruments including electronic components
 - Learn to prepare research reports
 - Use statistical methods for evaluating and interpreting data
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Withdrawal Policy: This course will follow the University policy on withdrawals stated in the current Undergraduate Catalog. Drop dates are listed in the Schedule of Classes.

Missed Examination Policy: Students may be excused from an experiment in cases of emergency. Documentation must be supplied to be excused. In cases of excused absence, grades will be assigned based on % of adjusted total score. No repetition of experiments is permitted.

Attendance Policy: Attendance will not be taken. Attendance is mandatory for successful performance in this course.

Student Disability Statement: Any student with a disability that requires accommodations must contact the Instructor. The disability must be documented by the Disability Resource Center. Course materials may be requested in alternative formats.

Laboratory Fee Statement: The laboratory fee for this course is used to purchase equipment and supplies for the laboratory.

Developed Laboratories:

The following topics have written laboratory procedures. Students may do other experiment they find in the books, laboratory manuals, etc., by proposing these.

- Electronic Measurements
 - Operational Amplifiers
 - Infrared Spectroscopy
 - Fluorescence Spectrometry
 - Atomic Absorption Spectrophotometry
 - Ultraviolet Spectrophotometry
 - ~~Ion Chromatography~~
 - HPLC
 - ~~GC/MS or GC/ECD or GC/AED~~
 - High-Accuracy pH Measurement
 - Fluoride Ion Selective Electrode
 - Nuclear Magnetic Resonance
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