



CHEM 463 – Current Microanalytical Methods Class Syllabus

Instructors: Dr. Grady Hanrahan, Phone (323) 343-2365
Email: ghanrah@calstatela.edu
Dr. Scott Nickolaisen, Phone (323) 343-2382
Email: snickol@calstatela.edu

Office Hours: Dr. Hanrahan P.S. 807 M, W, F 10:30am-12:00pm or by appointment
Dr. Nickolaisen P.S. 820 M 12:30-1:30 pm, T & TH 10:30-12:00

Lecture: 01 T & TH 09:50-11:05 am, BIOS 245

Laboratory: 02 T & TH 1:00pm-4:00pm, P.S. 824

Course Description & Objectives:

CHEM 463 will provide students a solid background in modern instrumental methods as well as providing field-based learning exercises. It will also provide richly detailed insights into the practical factors which affect representative sample collection and preparation (extraction, pre-concentration, clean-up), instrumental analysis and quality data assurance of a wide range of contaminants and biological materials.

More detailed objectives include:

- To learn both classical and modern instrumental aspects of microanalysis;
- To learn the analytical process as applied to basic laboratory and field research;
- To become familiar and later master the elements of good laboratory practice;
- To ultimately apply his/her knowledge of microanalysis in an independent manner.

Prerequisites for this class include: CHEM 201, MATH 206 and PHYS 103.

Required Textbook:

Laboratory Experiments in Environmental Chemistry, D. Neal Boehnke & R. Del Delumyea, Prentice Hall.

Lecture Schedule: Spring 2005

<u>Dates</u>	<u>Subject</u>	<u>Chapter(s)</u>
Week 1	Course Overview, Statistical Treatment of Data.	Part 1, Notes
Week 2	Properties of Natural Waters, Soils & Atmospheric Processes.	Parts 1-4, Notes
Week 3	Sampling, Storage and Pre-Treatment Techniques.	Part 1, Notes
Week 4	Instrumentation Overview, Optical Spectroscopy	Part 2, Notes
Week 5	Atomic Spectroscopy & Applications EXAM 1	Part 2, Notes
Week 6	Mass Spectrometry & Applications	Notes
Week 7	Gas and Liquid Chromatography & Applications	Part 3, Notes
Week 8	Flow Injection Techniques & Applications	Notes
Week 9	Electroanalytical Methods & Applications	Notes
Week 10	Quality Control & Assurance	Notes
Week 11	Final Exam June 9, 2005 8:00 am-10:30 am	

Laboratory Schedule of Experiments

	<u>Expt #</u>					
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>
Group 1	Field Sampling	DDT Analysis by GC	Spectro. Determination of Iron	Trace Metal Analysis by AA	Hydrocarbon Analysis by FID-GC	Determination of Copper by ASV
2	Field Sampling	Spectro. Determination of Iron	Trace Metal Analysis by AA	Hydrocarbon Analysis by FID-GC	Determination of Copper by ASV	DDT Analysis by GC
3	Field Sampling	Trace Metal Analysis by AA	Hydrocarbon Analysis by FID-GC	Determination of Copper by ASV	DDT Analysis by GC	Spectro. Determination of Iron
4	Field Sampling	Hydrocarbon Analysis by FID-GC	Trace Metal Analysis by AA	DDT Analysis by GC	Spectro. Determination of Iron	Determination of Copper by ASV
5	Field Sampling	Determination of Copper by ASV	DDT Analysis by GC	Spectro. Determination of Iron	Trace Metal Analysis by AA	Hydrocarbon Analysis by FID-GC

Laboratory work

Items required include: A scientific calculator, approved safety goggles, latex gloves (bookstore) and bound notebooks (quad-ruled composition book, bookstore). Students must inform their instructors in advance if a laboratory will be missed. Failure to do so may result in the student being dropped from the class.

Flow Charts

A work outline (flow chart) with estimated times for each step in each experiment is required at the beginning of each lab and must be written in the left side of notebook before each new experiment (see notebook format below).

Laboratory Notebook Format (no spiral notebooks will be accepted)

Record all experimental work in a stiff-covered, permanently bound notebook (National, # 53-110) and use the right hand pages of the notebook for the experimental records. Flow chart must be placed on left hand pages. The first two pages of the notebook are to be saved for Table of Contents. No pencils or erasable ink may be used. If an error is made, simply place a single horizontal line through mistake and enter correction. Be sure to write down important procedures in lab book before each lab. No photocopies of manual or procedures in lab book.

Each experiment record and report **must include** the following:

1. Name, date and quarter

2. Experiment title, and objective(s) (including equations)
3. A concise description of the experimental procedure
4. Data and important observations
5. Calculation methods
6. Results and discussion (graphs included)
7. References (must have at least one other than your textbook or lab handout)

Note: Any balanced equations or mathematical expressions are to be put at end of objective(s). The penalty for not having a lab book is **10** points. Outside of book must be labeled with name (printed), Chem 463, instructors name and Quarter taken. Lab books will be graded twice during the quarter (unannounced).

Laboratory Reports (See last page for detailed descriptions of sections)

Formal laboratory reports will be required for all experiments. These reports must follow the format below. Reports will be due the next lab period after you finish your instrumental analyses. Reports must be a concise description of the experiment with all appropriate data and graphs. The format includes (in order):

1. Cover page with title of experiment, name, date and date.
2. Abstract
3. Introduction
4. Experimental procedures
5. Results, including data and relevant graphs
6. Conclusion
7. References
8. Acknowledgments

Laboratory safety

Some important points to keep in mind:

1. Safety glasses must be worn at all times in the lab
2. No food or drinks in the lab
3. No shorts or open toed shoes allowed
4. Work with concentrated acids and bases in the appropriate hoods
5. Report any accidents to laboratory instructor or assistant
6. Be aware of all safety demonstrations in video
7. Be aware of all exits and safety equipment including eye wash and fire extinguisher.

Laboratory etiquette

It is essential that you consider others in the lab. Be careful with acids and reagents and clean up any spills that may occur. Always keep your work areas clean and never transfer samples in the analytical balance (points will be deducted). Cleaning assignments will be given by the instructors during each lab period.

Waste Disposal

It is important that you follow all waste disposal procedures clearly and place in appropriate containers (as shown by instructor on first day of lab). Each individual experimental lab handout will have detailed instructions on how to dispose of waste generated. If you have any questions, please see the instructors before you discard any waste you are unsure about.

Point Distributions for Grades

Lecture: 2 x 100 point exams
Total = 200 points

Laboratory: Experimental reports 5 x 100
Laboratory notebook 50 points (25 for each grading)
Laboratory skills/technique 50 points
Total = 600 points (800 comprehensive points)

Grades will be assigned as traditional (A, B, C, D, & F) and based on points accumulated. However, class attendance, distribution of points and individual participation will be taken into consideration on final grades. To pass this course, students must complete all laboratory work. Students will receive an (F) if laboratory work is not completed (unless a documented excuse, e.g., medical).

Makeup exams will be given at the discretion of the instructors in cases of family emergencies and illness (with doctors excuse) only. Otherwise, a weighted average of other exams will be given.

Dropping the course/Incompletes

Hopefully, a student will not be dropping this course. However, in the event that this is necessary the student must meet all university rules and deadlines. In addition, the student must check out the laboratory at the time he drops the course and during the normal lab period. Lockers not properly checked out will result in the student being charged a \$10 fee in addition to broken or missing equipment. In the case of an incomplete, the student must be making a (C) in the course and the reason for the incomplete an illness or an accident. An INCOMPLETE GRADE REPORT form must be completed and given to the instructor by the end of the examination week.

Formal Report Sections – Detailed Description

Abstract

A concise summary of the work performed and contains the key results. No introduction or background material should be placed here.

Introduction

Here one states the aim, the historical and theoretical context of the work. Include any relevant chemical equations or reactions. Should be concise, but have enough information for a complete introduction.

Experimental Procedures

This section is used for describing experimental procedures, conditions, apparatus and reagents used in the experiment.

Results

The data obtained in the experimental section is either tabulated and/or graphically displayed. Results from these data are calculated in this section. Show all data and calculations used.

Conclusion

This section contains a critical evaluation of the data gathered and the errors inherent in them. Be specific and thorough in your narrative.

References

Throughout the body of the manuscript, statements used which derive from external sources require defense based on previous work. These statements must be denoted numerically either with a superscript or in parenthesis in the text, and then the source listed in the Reference section by that number.

For example:

1. J. Peabody and H. Originales, “The Behavior of Copper Ions in Aqueous Solution.”
Journal of Analytical Results, **21**, 345-350.

-where **21** is the journal volume and 345-350 are the page numbers.

Acknowledgments

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