



Chemistry Department

Quantitative Analysis

CHEM 2103

Summer 2017



- **Lecturer:** Dr. Nick Thomas
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- **Class Days:** Tuesday/Thursday
- **Class Times:** Starting 1 pm (period 3)
- **First Class Day:** Thurs, June 1

Website

www.getnickt.com - Here you will find study questions from the text, instructions for using burets and pipets, and other important information about the course (note: instructor does not use Blackboard)

Course Description

Quantitative Analysis (5). Pr., CHEM 1200 and CHEM 1201. Theory and application of volumetric and gravimetric analysis. Most industrial employment opportunities require CHEM 2103 and a knowledge of instrumental analysis. *This writing-intensive course is a partial completion of AUM's 5-course WAC program requirement.*

Text

To be announced (none to buy). The Quantitative Analysis lab manual is available at the AUM bookstore (you have to buy this!). **Safety goggles** must be obtained by each student and worn for every lab and **at all times**. Students who have to be reminded to keep safety goggles on will have 10% lab grade deducted - no ifs, buts, or maybes! A list of experiments to be performed can be found on the accompanying course timetable.

Course Objective

The course is designed to illustrate the theoretical principles and practical techniques of quantitative analysis. Laboratory work is an essential component of this course and will consist of set experiments which illustrate a variety of techniques. There will be TEN experiments for students to perform. Students will work in groups of TWO, but each student will record his or her own data, and write up reports individually. You will change lab partners every week.

Attendance

Students have an obligation to attend ON TIME all lectures and laboratory sessions. Lectures commence Thursday, June 1, and will begin promptly at 1:00 pm each Tuesday/Thursday (period 3) in room 319 Goodwyn Hall - see timetable. Please be on time as late arrivals can be disturbing. Labs are Tuesday/Thursday (usually both days, but not every week - see timetable). Regardless of whether or not we have lab/lecture on a particular day, always come to room 319 first. Sometimes we have lecture/no lab; sometimes lab/no lecture; sometimes both.

Lecture and lab are both requirements for CHEM 2103 for which you will receive one final letter grade based on the following scale:

A = 90-100 % B = 80-89 % C = 65-79 % D = 50-64 % F < 50 %

Students are required to sign an attendance roll each class every day for the entire term.

Note:

- 1. Unless you have a pending emergency please switch off cellphone ringers whilst in class as they are very distracting to all.**
- 2. No cell phones/ipads/music devices etc. may be used during exams; only non-programable calculators**

Registration

All students must be officially registered. Contact the registrar's office if you have any doubts concerning your registration status.

Course Outline

- ☆ Introduction. Review of fundamental concepts. Practical applications of analytical chemistry (e.g. quality control, pollution monitoring, forensic chemistry). Apparatus used.
- ☆ Steps in a chemical analysis. Plan of analysis. Sampling, sample preparation and problems encountered during analysis. Evaluation of results. Modern analytical techniques.
- ☆ Gravimetric analysis. Basic techniques. Problems encountered during analysis.
- ☆ Treatment of data. Statistical analysis of results. Significant figures and error calculations.
- ☆ Volumetric analysis. Introduction and general procedure.
- ☆ Spectrophotometric analysis. Techniques of instrument operation. Atomic absorption spectrometry.

Grading

There will be 3 exams during the term, the third one being the final. Each exam will each count a maximum of 100 points towards the final grade. All 3 exams must be taken (no drop test). If an exam is missed, a comprehensive make-up exam will be given along with the third test at the end of the semester.

The laboratory grade will be based on the NINE highest written laboratory reports (students do TEN, one lab may be dropped; but the three containing WAC writing assignments must be completed or be graded as zero). Lab will be graded out of a total 120 points.

Three labs will require additional writing sections as part of the WAC program and will each be graded out of 20 points (10 points for regular lab report and 10 points for writing component). Details will be provided on the first day of class.

Points breakdown:

3 exams 100 pts each: 300 pts

6 regular labs, 10 pts each: 60 pts

3 WAC labs, 20 pts each: 60 pts

Additional 'mystery' writing assignment: 20 pts

Total: 440 pts

If a lab is missed FOR ANY REASON, it will automatically be the dropped lab. A grade of zero will be given for all other missed labs (it is not possible to make up ANY missed labs). **All lab reports will be due the following class, except the gravimetric labs.** Details in class. Late labs will lose 1 points per day, no exceptions. Also, if you miss a lab, you CANNOT obtain results from another student. You have to do the lab and obtain the results in order to get credit.

Make-up exams

Please note: Individual make-up exams will NOT be given. If one exam is missed FOR ANY REASON (other than an official documented university activity), it will automatically be made up with the comprehensive make-up exam at the end of the semester.

Make-up labs

Individual make-up labs will NOT be given. You can drop one lab; any other missed lab will be given a zero grade.

Lab reports

Labs will be held in Room 306G. A short pre-lab discussion will be given in the classroom (319G) at the **beginning** of the lecture preceding the lab. ***Be sure to be on time*** - if you miss this information, you're on your own with the lab manual!

Each lab report should contain an introduction (summary of what the lab is about), the completed data sheet, and answers to questions/calculations. Be sure to show **all steps** in calculations for full credit and give answers to the correct number of significant figures. Remember, you collect and share the data with your lab partner, but **each person must write and submit his or her own report.** *You will also be changing lab partners each week.*

Labs are usually due the next lab class. Staple pages together and place report in folders provided on the front desk of the lab. Each lab is graded out of 10 (except WAC labs, graded out of 20). After your graded labs are returned, keep them until the end of the term.

Important: Once the instructor returns the graded labs to the class, late labs will not be accepted under ANY circumstances.

And just so you're clear: If you miss a lab you CANNOT get results from someone else and submit a report. You must complete a lab yourself to get credit.

The WAC labs will also contain a background essay section for which you will write about the history and general details of the three main techniques (gravimetric, volumetric, and spectrophotometric analysis - details given in class). These need to be written using a computer, especially the first one as you will have a chance to rewrite the essay portion after the instructor evaluates it. (See more info below about the WAC assignments).

Check-in sheets and safety regulation sheets (found at the end of the lab manual) are to be read, signed, removed from the lab manual, and given to the instructor on the first day of lab.

Special Needs

Students with disabilities who require special attention should contact the instructor during an office hour in the first week of the quarter. *AUM attempts to make reasonable accommodations to meet the special needs of its disabled students.*

Assistance

Office hours will be posted on the instructor's office door. Additional appointments may be made with the instructor. The Instructional Support Lab (203G) can provide tutoring.

Learning Outcomes

After completion of this course, students will be able to analyze:

1. Methods of gravimetric, volumetric and spectrophotometric analysis
2. Error and data calculations
3. Methods of quantitative analysis

Please note the following

Knowledge of material covered in CHEM 1100 and CHEM 1200 is assumed.

A large exam book (blue book) will be required for each exam; **graph paper** will be needed for the final exam and last lab.

Chemistry is a 'cumulative' subject. Knowledge of material learned in general chemistry is assumed.

Significant home study **each day** is therefore essential for this course.

AUM's Writing Across the Curriculum (WAC) Program

Information on AUM's WAC program can be found at www.aum.edu/writing

This writing-intensive course is in partial completion of AUM's 5-course WAC program requirement.

Requirements: Because this is a writing-intensive course, students will be required to complete a minimum of 4 written products; students will have opportunities for prewriting, drafting, feedback (peer and/or individual), and revision during the drafting of at least one of these written products.

WAC Assignments

There are four writing assignments associated with this course. Three are part of the lab work and details are explained below. There is also another writing project, the details of which will be explained in class.

Lab Writing Assignments

These will be three WAC assignments associated with the following labs:

Lab #3. Gravimetric Analysis of Calcium

Lab # 9. Volumetric Analysis of a Soda Ash

Lab #10. Spectrophotometric Analysis of Manganese in Steel

In addition to the regular sections for each lab write-up (Introduction, Data Sheets, Answers to questions/Calculations), each of these three labs will contain an essay section (~500 words) outlining the general principles of the main analytical technique used (gravimetric, volumetric or spectrophotometric analysis). You may include historical information on the technique, as well practical applications and theory information. Cite all sources.

The first assignment (Gravimetric Analysis of Calcium), must be written using a word processor as the instructor will read, make comments, and return for revision. Due dates as follows:

Gravimetric Analysis Draft: due Thurs 6/15 (final version due 6/27)

(note: draft will be returned the following class period, you will revise and resubmit by the above date for final grading)

Mystery assignment discussion: 6/29

Volumetric Analysis: Due 7/13

Spectrophotometric Analysis: Due 7/27