



CHEM 340-01B: Quantitative and Instrumental Analysis

Instructor: Dr. Laurence Angel

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Office Hours: Mon-Fri 4:00 – 5:00 pm

Class Meetings: Tues/Thurs 9:30 – 10:20 am, enhanced with D2L online material

Laboratory Meetings: Tues/Thurs 2.00 – 5.50 pm, Science 313

This is a blended class with face-to-face lectures delivered with additional material on the online platform D2L. There will be weekly reading and homework assignments, which will be evaluated by 4 midterm exams and a final comprehensive exam. The class material will closely align with the experimentation portion that will be conducted in the Chemistry Department's labs. The schedule can be found below.

Student Learning Outcomes: The course will familiarize the student with a range of quantitative chemical analysis techniques for accurately determining the quantities of an element or a chemical species in a sample. The student will be expected to understand the theory and applications of these chemical analyses techniques and be able to explain the concepts to their peers. Analysis techniques covered will include statistical analysis, acid-base equilibrium, redox titrations, EDTA titrations, ultraviolet-visible spectrophotometry, and electroanalytical techniques. By the end of the course, the student will be able to select an analytical technique best suited to solve a given quantitative analytical problem. During the course, students will be required to keep organized and well written laboratory books and hand in weekly reports that clearly convey the experimental details and results of their work. Knowledge of quantitative chemical analysis techniques including instrumental analysis is essential in a wide range of potential employment positions in industry, government and academia.

Course Materials: *Exploring Chemical Analysis, 4th Ed., Daniel C. Harris, Freeman.* ISBN 9781429201476 and a **non-programmable** calculator.

Credits: 4 Course Credits: 2 credit hours for class and 2 credit hours for laboratory.

Laboratory Experiments: You will find the handouts for the laboratory procedures in the CHEM 340-01L course site during the semester, and you should **print out a copy** for the lab. You will also need a **proper laboratory notebook, safety goggles, and a hand**

non-programmable calculator. Proper clothing is needed for the labs including full length pants and shoes. Long hair must be tied back. Laboratory coats are recommended.

Prerequisite: The student must have completed CHEM 1312 and CHEM 1112 in order to enroll in CHEM 340. Having completed CHEM 2323 and CHEM 2324 is also desirable but not a requirement.

Tips for Success in the CHEM 340 Course: The lectures on this course will cover topics from Chapters 1 through 19 of the assigned textbook. This material will be covered at the rate indicated by the *Tentative Class Schedule*. **Be sure to read the textbook before coming to the lectures.** The lectures will focus on important chemistry concepts but will not serve as a substitute for reading and practicing the assigned homework questions from the textbook. The textbook has a more detailed presentation with a more extensive set of example problems. Chemistry is a physical science and it is imperative to master calculations and use your calculator correctly to pass the course. **Finish your homework promptly.**

GRADING

Mid-semester exams: 4 exams held during semester (10% each, 40% total)

Laboratory reports: 10 graded laboratory reports (4% each, 40% total)

Final ACS exam: Comprehensive ACS exam held at the end of the semester (20%)

Grading: General grade range of A: > 86%, B: 75-86%, C: 64-74%, D: 50-63%, F: <50

Laboratory Procedures and Requirements: We shall go over laboratory safety, procedures and reports in the first session of the laboratory schedule in Science Lab 313. Each experiment will be graded out of 100% based on your lab performance (15%), the accuracy of your final result using the relative error shown below and whether it includes the “true” value (40%), presentation of the report and the correct conversion of the raw data into final data (30%), and your lab performance and whether the pre-lab and proper use of the lab book was complete (15%).

Relative Error	Grade /40
0-5 ppt	40
5-15	36
15-25	32
25-40	28
40-70	24
70-100	20
100-150	16
>200ppt	8

$$\text{relative error} = \frac{\text{exp. value} - \text{known value}}{\text{known value}} \times 1000$$

Preparation for the lab is required: 5 points of the grade will be deducted if the pre-lab assignments are not finished before the lab. **Writing on scraps of paper during lab will result in 5 points deducted from your grade.** All the experimental results should be written in your **lab book** and this should be **well organized and clearly presented**. See the lab report handout for details on proper presentation and recording of your experiments. Unsafe or poor conduct during the lab will result in 15 points deduction.

Late work will not be accepted, and makeup exams or labs will not be given unless the instructor considers it is for a valid reason. If you miss an exam the points for the missed exam will be placed on your final exam, making your final exam count for a greater percentage of your grade. The final exam will be comprehensive. Laboratory Portion: 40% of course grade. Ten laboratory reports will be required. Any additional missed labs will result in a zero for that lab.

COURSE OUTLINE / CALENDAR

Tentative class schedule and reading assignments: chapters from **Exploring Chemical Analysis**, 4th Edition, Daniel C. Harris, W.H. Freeman and Company.

Week Starting	Chapters and Topics
1	1 and 2 Chemical Measurements, Tools of the Trade
2	3 and 4 Math and Statistics
3	6 Good Titrations
4	8 Acids and Bases Exam 1
5	9 Buffers
6	10 Acid-Base Titrations
7	11 Polyprotic Acids and Bases
8	11 Polyprotic Acids and Bases Exam 2
9	13 EDTA Titrations
10	14 Electrode Potentials
11	15 Electrode Measurements
12	16 Titrations Involving Iodine or Bromine Exam 3
13	16 Redox Titrations
14	18 Let There Be Light (Thanksgiving)
15	Review Exam 4
16	Final Comprehensive Exam

Tentative laboratory schedule

Week Start	Laboratory
1	Check in, Laboratory Safety, Introduction to Laboratory Reports.
2	Excel Software Lab
3	Calibration of Buret
4	Preparing and Standardizing of Carbonate-Free 0.1 M NaOH
5	Determination of the Composition of a KCl – NaCl Mixture
6	pH Titration of Soda Ash
7	Equilibrium Constants of a Weak Diprotic Acid and Equivalence Point pH
8	ACS meeting
9	EDTA Titration of Ca^{2+} and Mg^{2+}
10	Spectrophotometric Titration of Copper(II) with EDTA
11	Potentiometric Halide Titration with Ag^+
12	Determination of Ascorbic Acid in Vitamin C Tablets
13	Spectrometric Determination of Iron in Vitamin Tablets

14	Thanksgiving
15	Check-out

COURSE AND UNIVERSITY PROCEDURES/POLICIES

Course Specific Procedures/Policies

Syllabus Change Policy

The syllabus is a guide. Circumstances and events, such as student progress, may make it necessary for the instructor to modify the syllabus during the semester. Any changes made to the syllabus will be announced in advance.

University Specific Procedures

Student Conduct

All students enrolled at the University shall follow the tenets of common decency and acceptable behavior conducive to a positive learning environment. The Code of Student Conduct is described in detail in the Student Guidebook.

<https://inside.tamuc.edu/admissions/registrar/documents/studentGuidebook.pdf>.

Students should also consult the Rules of Netiquette for more information regarding how to interact with students in an online forum: <https://www.britannica.com/topic/netiquette>

ETAMU Attendance

For more information about the attendance policy please visit the [Attendance](#) webpage and Procedures 13.99.99.R0.01

<http://www.tamuc.edu/admissions/registrar/generalInformation/attendance.aspx>

Academic Integrity

Students at East Texas A&M University are expected to maintain high standards of integrity and honesty in all of their scholastic work. For more details and the definition of academic dishonesty see the following procedures:

[Undergraduate Academic Dishonesty 13.99.99.R0.03](#)

[Undergraduate Student Academic Dishonesty Form](#)

<http://www.tamuc.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/documents/13.99.99.R0.03UndergraduateStudentAcademicDishonestyForm.pdf>

Graduate Students Academic Integrity Policy and Form

[Graduate Student Academic Dishonesty Form](#)

<https://inside.tamuc.edu/aboutus/policiesProceduresStandardsStatements/rulesProcedures/13students/graduate/13.99.99.R0.10.pdf>

Students with Disabilities-- ADA Statement

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you have a disability requiring an accommodation, please contact:

Office of Student Disability Resources and Services

East Texas A&M University

Velma K. Waters Library Rm 162

Phone (903) 886-5150 or (903) 886-5835

Fax (903) 468-8148

Email: studentdisabilityservices@etamu.edu

Website: [Student Disability Services](https://www.etamu.edu/student-disability-services/) <https://www.etamu.edu/student-disability-services/>

Nondiscrimination Notice

East Texas A&M University will comply in the classroom, and in online courses, with all federal and state laws prohibiting discrimination and related retaliation on the basis of race, color, religion, sex, national origin, disability, age, genetic information or veteran status. Further, an environment free from discrimination on the basis of sexual orientation, gender identity, or gender expression will be maintained.

Campus Concealed Carry Statement

Texas Senate Bill - 11 (Government Code 411.2031, et al.) authorizes the carrying of a concealed handgun in East Texas A&M University buildings only by persons who have been issued and are in possession of a Texas License to Carry a Handgun. Qualified law enforcement officers or those who are otherwise authorized to carry a concealed handgun in the State of Texas are also permitted to do so. Pursuant to Penal Code (PC) 46.035 and East Texas A&M Rule 34.06.02.R1, license holders may not carry a concealed handgun in restricted locations.

For a list of locations, please refer to the [Carrying Concealed Handguns On Campus](#) document and/or consult your event organizer.

Web url:

<http://www.tamuc.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/34SafetyOfEmployeesAndStudents/34.06.02.R1.pdf>

Pursuant to PC 46.035, the open carrying of handguns is prohibited on all East Texas A&M campuses. Report violations to the University Police Department at 903-886-5868 or 9-1-1.

East Texas A&M University Supports Students' Mental Health

The Counseling Center at East Texas A&M University, located in the Halladay Building, Room 203, offers counseling services, educational programming, and connection to community resources for students. Students have 24/7 access to the Counseling Center's crisis assessment services by calling 903-886-5145. For more information regarding Counseling Center events and confidential services, please visit www.etamu.edu/counsel

Mental Health and Well-Being

The university aims to provide students with essential knowledge and tools to understand and support mental health. As part of our commitment to your well-being, we offer access to Telus Health, a service available 24/7/365 via chat, phone, or webinar. Scan the QR code to download the app and explore the resources available to you for guidance and support whenever you need it.



<http://telusproduction.com/app/5108.html>

AI use policy [Draft 2, May 25, 2023]

East Texas A&M University acknowledges that there are legitimate uses of Artificial Intelligence, ChatBots, or other software that has the capacity to generate text, or suggest replacements for text beyond individual words, as determined by the instructor of the course. Any use of such software must be documented. Any undocumented use of such software constitutes an instance of academic dishonesty (plagiarism).

Individual instructors may disallow entirely the use of such software for individual assignments or for the entire course. Students should be aware of such requirements and follow their instructors' guidelines. If no instructions are provided the student should assume that the use of such software is disallowed.

In any case, students are fully responsible for the content of any assignment they submit, regardless of whether they used an AI, in any way. This specifically includes cases in which the AI plagiarized another text or misrepresented sources.

[Undergraduate Academic Dishonesty 13.99.99.R0.03](#)

[Graduate Student Academic Dishonesty Form](#)