

**CHEM 3110 Laboratory for Analytical Chemistry (CRN: 11230/11888/18440)
FALL 2022**

Instructor:

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Office hours: Tuesday and Thursday 12:00
PM – 1:00 PM



Teaching Assistants:

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Office hours: by appointments only.

I. Textbook: No textbook is required for this course. Laboratory activities will be posted on the course Blackboard site.

II. Course Objectives:

To practice and improve students' skills and knowledge in quantitative analytical chemistry. Students will gain an understanding of:

- a. qualitative and quantitative chemical analysis;
- b. the application of statistical methods for the evaluation of laboratory data;
- c. methods for calibration and sampling applied to quantitative analysis;
- d. assessment methods of analysis related to chemical analysis goals such as detection limits;
- e. the performance of graphical analysis to analyze laboratory results;
- f. the application of analytical methods based on titrations, separations, electrochemical measurements, and spectroscopy at an introductory level; and
- g. the design and application of an analysis related to a question of relevance based on experience in the laboratory and research of the scientific literature

III. Course Description:

- These experiments are intended to illustrate the major analytical techniques described in the lecture.
- Every Monday at 1:30 PM we will have student presentations about basics of the lab content, followed by hand-on experiments of the week.

- A pre-lab quiz will be available each week, to test basic knowledge about the lab.
- It is important that you invest in good preparation BEFORE coming to lab by reading the lab manuals and writing your own outlined procedure for each lab.
- A maximum of two chances will be given to make-up any missed lab but it has to be made up on the same week of absence.

IV. Course Evaluation:

You will be evaluated based on your overall grasp of the skills, concepts, and participation in the laboratory experiments and written exercises. Your overall lab grades will depend on:

| Assessment Items | Points | | Due Date |
|--------------------------|----------------------------|---------|--|
| | Numeric | Percent | |
| a) Pre-Lab Quizzes | 24 points each= 240 | 20 % | Every Monday at 1:29 PM. |
| b) Student presentations | 24 points each= 240 | 20% | Every Monday at 1.30 PM |
| c) Lab Reports | 36 points each= 360 | 30 % | The day before the next experiment at 11:59 PM. |
| d) Final Exam | 300 points | 25 % | December 01, 2022 at 11:59 PM. |
| e) Attendance | 6 points each = 60 | 5 % | |
| TOTAL POINTS | 1200 | 100% | |

Grade Breakdown:

| | | | | | | | | | | | |
|--------|------|-------|----------|-------|----------|-------|----------|-------|----------|-------|----------|
| Points | 1200 | ----- | 1056 | ----- | 936 | ----- | 816 | ----- | 660 | ----- | 0 |
| % | 100 | ----- | 88 | ----- | 78 | ----- | 68 | ----- | 55 | ----- | 0 |
| | | | A | | B | | C | | D | | F |

- a) **Pre-Lab Quizzes (in blackboard)** - Pre-Lab Quizzes will be available each week in blackboard for the upcoming lab experiment. Pre-labs are due by 1.29 PM every Monday. There will be no pre-lab for the first experiment. The quizzes are designed to test your basic understanding of the materials for the specific week. No make-ups for pre-lab will be given.
- b) **Lab Reports:** Reports are turned in on group basis in blackboard. A lab notebook is highly encouraged for recording data during experiments. Lab reports will only be counted if you attend the lab. Any missed lab will result in a zero on that lab.

Reports should be uploaded to Blackboard before due date which is the day before the next lab by 11:59 PM. Reports submitted past the deadline will not be accepted.

LABORATORY REPORT REQUIREMENTS:

A lab report (by group) should contain the following components.

1. Your name and your lab partners' names. Please include the name and percent effort that each member has contributed into the report and experimental processes. (1 pt)

2. The date that the experiment was performed. (1 pt)
3. Title of the experiment. (1 pt)
4. Objectives of the experiment. (3 pts)
5. Introduction: A description of the basic theory of the experiment and the operation of the instrument used. (5 pts)
6. Materials and Methods: (5 pts)
 - List all chemicals (including solvents) to be used. List formula weights for each substance and other useful information such as the physical properties, MSDS, etc. Find this information in the reference libraries, or on-line.
 - A clearly and concise procedure statement. You are required to use a flow chart to illustrate the procedure.
7. Results and Discussions: (15 pts)
 - Data, numerical analysis, graphs, tables, etc. Show appropriate calculations and clearly identify important answers. Always use units in your calculations. Be sure to indicate any uncertainties.
 - Discussions of the results: Describe experimental conditions, observations, and interesting finding. You may find references to support your hypothesis and statements.
 - Discussions of any challenges or mistakes that you encounter during the experiment and how your group address the problems.
8. Conclusion: A conclusion statement summarizing the result and any conclusion. A summary statement about the data found and the determined results must be clearly stated. Also indicate what you have learned in this experiment. (3 pts).
9. References: List at least 2 references cited in your reported. (2 pt).

c) **Final Exam:** A comprehensive exam will be given at the end of the semester.

d) **Attendance** - You must be present during each lab experiment to be eligible for a grade on this category. DON'T SCHEDULE OTHER APPOINTMENTS/commitments during this lab time, as your grade will suffer if you are not in the lab at the scheduled times.

V. Course Policies:

- Goggles are required in the lab. No open toe shoes are allowed.
- The labs are long and you will need to use your time wisely.
- **Academic honesty:** Materials (reports, quizzes, exam or otherwise) submitted to fulfill academic requirements must represent a student's own efforts. Any act of academic dishonesty attempted by a UTEP student is unacceptable and will not be tolerated. Academic dishonesty is prohibited and is considered a violation of the UTEP Handbook of Operating Procedures. It includes, but is not limited to, cheating, plagiarism, and collusion. Violations will be taken seriously and will be referred to the Dean of Students Office for possible disciplinary action. Students may be suspended or expelled from UTEP for such actions.

VI. Others:

- **Safety:** Please practice safety.
 - Safety eyewear and labcoats must be worn during experiments.
 - Cell phones must be turned off. **NO EXCEPTIONS.**
 - Open-toe shoes are not allowed.
 - Gloves should be worn when appropriate and recommended by the instructor.
 - Long hair must be tied back so it will not accidentally fall into an experiment.
 - No foods or drinks are allowed in the lab.
 - You must wash your hands after dealing with chemicals or dirty glassware, and when you are done with the lab.
 - Always look behind you before beginning to move in a lab.
 - Speak loud and clear to warn others of an accident and or potential danger.
 - Know your safety options before you begin (sinks, shower, eyewash, gloves).
 - Know your path out of the lab, if it becomes necessary.
 - Know where the fire extinguishers are.
 - If an instructor is present during a fire, allow them to operate the fire extinguisher.
 - Know what can go wrong and be prepared with a solution.
 - Research any chemical that is unfamiliar to you. Know its properties.
 - Familiarize yourself with the first-aid supplies and their location.
- **Waste**

Improper waste disposal into the drain is not only dangerous to you, but hazardous to a whole community. Unpredictable and dangerous (explosive) chemical reactions can occur. Follow the directions given to you on the boards or hoods for properly disposing chemical waste. **Make sure to write down the name and the quantity of the waste put into the waste bottle.**

VII. Course Withdrawal Policy

Classes dropped prior to the official census date (**09/07**) will be deleted from the student's semester record. After this date, the University permits any student to drop with an automatic "W" by the course dropping deadline (**10/28**). After this date students who withdraw must receive grades of "F".

VIII. Course Calendar:

The content is tentative and subject to change. Any changes will be announced in advance.

| Week | Date | Subject |
|------|-------------|---|
| 1. | 08/22-08/26 | No lab – Preparation. |
| 2. | 08/29-09/02 | No lab – Preparation. |
| 3. | 09/05-09/09 | No Class – Labor Day Holiday. |
| 4. | 09/12-09/16 | Introduction/ Safety/ Check-In Exp. 1. Calibration of Volumetric Glassware. |
| 5. | 09/19-09/23 | Exp. 2. Gravimetric Determination of Calcium as Monohydrated Calcium Oxalate ($\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$). Exp. 3. Preparing Standard Acid and Base. |
| 6. | 09/26-09/30 | |
| 7. | 10/03-10/07 | Exp. 4. Statistical Evaluation of Acid-Base Indicators. Exp. 5. Analysis of a Mixture of Carbonate and Bicarbonate. |
| 8. | 10/10-10/14 | |
| 9. | 10/17-10/21 | Exp. 6. EDTA Titration of Ca^{2+} and Mg^{2+} in Natural Waters. Exp. 7. A Cyclic Voltammetry Study of the Oxidation of Ascorbic Acid ($\text{C}_6\text{H}_8\text{O}_6$) at the Glassy Carbon Electrode. |
| 10. | 10/24-10/28 | |
| 11. | 10/31-11/04 | Exp. 8. Determining Purity of a Potassium Permanganate (KMnO_4) Sample by UV-Vis Spectroscopy. Exp. 9. Using a pH Electrode for an Acid-Base Titration. |
| 12. | 11/07-11/11 | |
| 13. | 11/14-11/18 | No Lab – Thanksgiving Week. |
| 14. | 11/21-11/25 | Exp. 10 Using a Gas Chromatograph for Qualitative & Quantitative Analyses of Organic Compounds. |
| 15. | 11/28-12/01 | Final Exam. |