

# CHEM 4212 Laboratory for Chemistry 4211 (CRN: 20608,27942) SPRING 2024

## Schedule:

Lecture Tuesday 1:30 – 2:20 p.m. (PSCI 314)

Lab Tuesday & Thursday 2:30- 5:20 p.m. (CCSB G.0714)

### Instructor:

Sreeprasad Sreenivasan, Ph.D.

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**Office hours:** by appointments only.

### Teaching Assistant:

Abhirami Krishnan, PhD Student.

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Bhavna Kuli, PhD Student.

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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:**
  - a. To practice and improve your skills and knowledge in Instrumental analytical chemistry.
  - b. To apply the knowledge and gain hands-on experience in subjects covered in the lecture.
- III. **Course Description:**
  - These experiments are intended to illustrate the major analytical techniques described in the lecture.
  - Every Tuesday 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.

**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	50 points each X 9 = <b>450</b>	20 %	<b>Every Tuesday by 10:00 AM.</b>
b) Student presentations	50 points each X 9 = <b>450</b>	20 %	<b>Every Tuesday at 1:30 p.m.</b>
c) Lab Reports	75 points each X 9 = <b>675</b>	30 %	<b>The day before the next experiment at 11:59 PM.</b>
d) Final Project & Oral	<b>315</b> points	14 %	<b>April 15<sup>th</sup>, 2024</b>
d) Final Exam	<b>225</b> points	10 %	<b>April 29<sup>th</sup>, 2024</b>
e) Attendance	<b>135</b>	6 %	
<b>TOTAL POINTS</b>	<b>2250</b>	100 %	

**Grade Breakdown:**

Points	2250	-----	1980	-----	1755	-----	1530	-----	1305	-----	0
%	100	-----	88	-----	78	-----	68	-----	58	-----	0
			<b>A</b>		<b>B</b>		<b>C</b>		<b>D</b>		<b>F</b>

- 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 10:00 AM every Tuesday. The quizzes are designed to test your basic understanding of the materials for the specific week.
- b) **Student presentations:** Each group will present the designated content (details are included in the table of Tentative Schedule). The group-based presentation will be 5-7 min and 3-5 min of questions and answers.
- c) **Lab Reports:** Reports are turned in on individual 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.

- Your name (the group members name)
  - Each person's contribution in the report and experimental part in % ( 2 pt)

2. The date that the experiment was performed. (1 pt)
  3. Title of the experiment. (2 pt)
  4. Objectives of the experiment. (5 pts)
  5. Introduction: A description of the basic theory of the experiment and the operation of the instrument used. (10 pts)
  6. Materials and Methods: (15pts)
    - 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: (25 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. (10 pts).
  9. References: List at least 2 references cited in your reported. (5 pt).
- d) **Final Project:** A final project will be evaluated at the end of the semester. For that you must select one of the several techniques that is covered during the semester and apply it to solve an issue relevant to the community. You will collect the samples, prepare the experimental protocol, and come up with conclusions regarding the problem that is being investigated. The final evaluation will consist of a research report and a final presentation. The project will be done in a group basis and will be evaluated according to the following:
- 1- A tentative title and information about the instrument or instruments you will utilize during your research project. Send this information to your TA via email by **February 20, 2024**. (15 pts)
  - 2- A detailed project reports. Submit this final report by **April 15, 2024**. (150 pts).

FINAL PROJECT REPORT REQUIREMENTS:

- i. Your name and your lab partners' names. (2 pt)
- ii. The date that the experiment was performed. (1 pt)
- iii. Title of the experiment. (2 pt)
- iv. Introduction: A description of the basic theory of the experiment and the operation of the instrument used. (15 pts)

- v. Problem that you are trying to understand or solve and hypothesis. (15 pts)
  - vi. Objectives of the experiment. (15 pts)
  - vii. Materials and Methods: (30 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.
  - viii. Results and Discussions: (50 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.
  - ix. 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. (15 pts).
  - x. References: List at least 5 references cited in your reported. (5 pts).
- 3- To present your project on **April 15, 2024**. Each team will have 20 minutes total (150 pts).

FINAL ORAL PRESENTATION RUBRICS:

**i. Presence (10 pts)**

- body language & eye contact
- contact with the public
- poise
- physical organization

**ii. Language skills (10 pts)**

- correct usage
- appropriate vocabulary and grammar
- understandable (rhythm, intonation, accent)
- spoken loud enough to hear easily

**iii. Organization (20 pts).**

- clear objectives
- logical structure
- signposting

**iv. Mastery of the subject (60 pts).**

- pertinence
- depth of commentary
- spoken, not read
- able to answer questions

**v. Visual aids (35 pts).**

- slides
- handouts
- audio, video, etc.

**vi. Overall impression (15 pts).**

- very interesting / very boring
- pleasant / unpleasant to listen to
- very good / poor communication

- e) **Final Exam:** A comprehensive exam will be given at the end of the semester.
- f) **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 labtime, 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.
- There could be small modifications made to the syllabus during the semester. The instructor and TA will inform the student about any change by announcing in the class and on blackboard course site. However, it is the student's responsibility to attend the class and/or check the course site to keep up to date with any information that is provided to him/her and to use it responsibly.

**VI. Others:**

- **Safety:** Please practice safety.
  - Safety eyewear and lab-coats 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 (**02/13**) 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 (**03/31**). 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	Subject	Group	Content of Presentations
1. 01/15	No lab		
2. 01/22	No lab		
3. 01/29	Safety and Introduction & Instrument Tours.	All	N/A
4. 02/05	Identifying an Unknown Compound by Infrared Spectroscopy.	Group 1	Introduction
		Group 3	Procedure
	Spec 20 Visible Light Spectrometer- CoCl <sub>2</sub> and bromocresol green.	Group 2	Introduction
		Group 4	Procedure
5.		Group 1	Application

	02/12	Spec 20 Visible Light Spectrometer- $\text{CoCl}_2$ and bromocresol green.	Group 3	Application
		Identifying an Unknown Compound by Infrared Spectroscopy.	Group 2	Application
6.	02/19	Cyclic Voltammetry Investigation of the Oxidation of Acetaminophen and Quantification of its Content in Tylenol Tablets.	Group 1	Procedure
			Group 3	Introduction
		Measurement of Caffeine in Coffee Beans With UV/Vis Spectrometer.	Group 2	Procedure
			Group 4	Introduction
7.	02/26	Measurement of Caffeine in Coffee Beans With UV/Vis Spectrometer.	Group 1	Application
			Group 3	Application
		Cyclic Voltammetry Investigation of the Oxidation of Acetaminophen and Quantification of its Content in Tylenol Tablets.	Group 2	Application
			Group 4	Application
8.	03/04	Analyzing carbon-based materials with RAMAN Spectroscopy.	Group 1	Introduction
			Group 3	Procedure
		Quantification of Riboflavin in Energy Drinks by Fluorescence Spectroscopy.	Group 2	Introduction
			Group 4	Procedure
9.	03/11	Spring Break.		
10.	03/18	Quantification of Riboflavin in Energy Drinks by Fluorescence Spectroscopy.	Group 1	Application
			Group 3	Application
		Analyzing carbon-based materials with RAMAN Spectroscopy.	Group 2	Application
			Group 4	Application
11.	03/25	Analysis of Bisphenol A by GC/MS.	Group 1	Procedure
			Group 3	Introduction
		X-Ray Fluorescence Analysis of an unknown sample containing Fe, Ni and Cu.	Group 2	Procedure
			Group 4	Introduction
12.	04/01	X-Ray Fluorescence Analysis of an unknown sample containing Fe, Ni and Cu.	Group 1	Application
			Group 3	Application
		Analysis of Bisphenol A by GC/MS.	Group 2	Application
			Group 4	Application
13.	04/08	Acid Digestion (Hot Block) of Plant Samples to Analyze Cu Content Using ICP-OES	Group 1	Introduction
			Group 3	Procedure
			Group 2	Application
			Group 4	Application
14.	04/15	<b>Final Presentation.</b>		
15.	04/22	Study Break		

16.04/29	<b>Final Exam.</b>
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### **IX. Technology requirements**

Some course content is delivered via the Internet through the Blackboard learning management system. Ensure your UTEP e-mail account is working and that you have access to the Web and a stable web browser. Google Chrome and Mozilla Firefox are the best browsers for Blackboard; other browsers may cause complications. When having technical difficulties, update your browser, clear your cache, or try switching to another browser.

You will need to have access to a computer/laptop. You will need to download or update the following software: Microsoft Office, Lockdown Browser and Adobe Acrobat Reader. Check that your computer hardware and software are up-to-date and able to access all parts of the course.

If you do not have word-processing software, you can download Word and other Microsoft Office programs (including Excel, PowerPoint, Outlook and more) for free via UTEP's Microsoft Office Portal.

**IMPORTANT:** If you encounter technical difficulties beyond your scope of troubleshooting, please contact the UTEP Help Desk as they are trained specifically in assisting with technological needs of students. Please do not contact me for this type of assistance. The Help Desk is much better equipped than I am to assist you!

### **X. Course communication:** How we will stay in contact with each other

Here are the ways we can keep the communication channels open:

- Office Hours: By appointment
- Email: UTEP e-mail is the best way to contact us. We will make every attempt to respond to your e-mail within 48 hours of receipt. When e-mailing me, be sure to email from your UTEP student e-mail account and please put the course number in the subject line. In the body of your e-mail, clearly state your question. At the end of your e-mail, be sure to put your first and last name, and your university identification number.
- Announcements: Check the Blackboard announcements frequently for any updates, deadlines, or other important messages.

### **XI. Illness precautions**

Please stay home if you have symptoms of a communicable illness. If you are feeling unwell, please let me know as soon as possible, so that we can work on appropriate accommodation.



**XII. Make-up work**

Make-up work will be given only in the case of a documented emergency. A maximum of two chances (for the entire semester) will be given to make-up any missed lab(s) but it must be made up according to the availability of the scheduled labs. Note that make-up work may be in a different format than the original work, may require more intensive preparation, and may be graded with penalty points. If you miss an assignment and the reason is not considered excusable, you will receive a zero. It is therefore important to reach out to me—in advance if possible—and explain with proper documentation why you missed a given course requirement. Once a deadline has been established for make-up work, no further extensions or exceptions will be granted.

**XIII. Accommodations policy**

The University is committed to providing reasonable accommodations to students with documented disabilities. Students who become pregnant may also request reasonable accommodation, in accordance with state and federal laws and regulations and University policy. Accommodations that constitute undue hardship are not reasonable. To make a request, please register with the UTEP Center for Accommodations and Support Services (CASS). Contact CASS at 915-747-5148, email them at [cass@utep.edu](mailto:cass@utep.edu), or apply for accommodation online via the CASS portal.

**XIV. Guidance on artificial intelligence****AI prohibited**

Use of AI technologies or automated tools, particularly generative AI such as ChatGPT or DALL-E, is not allowed for assignments in this class. Each student is expected to use critical and creative thinking skills to complete tasks and not rely on computer-generated ideas. Any direct use of AI-generated materials submitted as your own work will be treated as plagiarism and reported to the Office of Student Conduct and Conflict Resolution (OSCCR).

**XV. Plagiarism detecting software**

Some of your course work and assessments may be submitted to SafeAssign, a plagiarism detecting software. SafeAssign is used to review assignment submissions for originality and will help you learn how to properly attribute sources rather than paraphrase.