

CHEM 5510: 001 (Computational Chemistry)
Chemistry Department,
College of Liberal Arts and Sciences, University of Colorado Denver

COURSE SYLLABUS

Instructor:	Hai Lin	Term:	Fall 2024
Office:	Science Building 4126B	Class Meeting Days:	Tuesday & Thursday
Phone:	303-315-7656	Class Meeting Hours:	2:00 – 3:15 pm
E-Mail:	hai.lin@ucdenver.edu	Class Location:	North Classroom 2001
Website:	https://clas.ucdenver.edu/chemistry/hai-lin	Lab Location:	n/a
Office Hours:	Tuesday & Thursday 3:30–4:45 pm & by appointments		

COURSE OVERVIEW

I. Welcome!

Welcome to Computational Chemistry! Computer modeling and simulations are right at the frontier of modern chemical and biochemical research. This course introduces you to the state-of-the-art techniques and tools for molecular visualization and modeling with atomistic details. You will find that the “boring” numbers generated by your computer can provide deep understanding to chemical and biological processes, complementing experimental observations. The knowledge in this course will offer you a refreshed perspective on the chemistry world!

II. University Course Catalog Description

Advanced course in chemistry. An introductory course on modern molecular modeling techniques and their applications to chemistry.

III. Course Overview

Materials covered: This course covers topics in molecular visualization, molecular orbital theory, geometry optimization, and molecular property predictions.

Computer skills: You will spend a lot of time “playing” with the Spartan Student computer program, which will be installed in your laptop/desktop. You do not need to be a computer genius or do a lot of computer programming, but you must have basic knowledge of computer (e.g., what a directory is, how to access a file, how to use spreadsheet programs for data analysis, and how to give presentations using PowerPoint slides...)

Knowledge in math: While this course does not require extensive math knowledge, it is essential to know basic calculus and linear algebra to understand the materials. Also, you need to understand numerical methods (e.g., the concept of convergence).

Knowledge in Physics: The molecular modeling techniques and data analyses in this course are based on knowledge in quantum chemistry that is covered in physical chemistry and organic chemistry. (Relax! You do not need to solve the Schrödinger Equation by hand or to build from scratch a program to solve it!)

Hands-on learning experience: This course emphasizes illustrating fundamental concepts through examples. Homework assignments play a major role to this mission. You must do the homework in time as instructed, and you are highly encouraged to actively participate in the discussion. You will need to **practice after the class**. Practice makes you perfect.

Emphasis on chemical insights: This course emphasizes the applications of available computational methods to typical questions in chemistry and biochemistry. Our goal is to obtain chemical insights, i.e., to relate the calculation results with the principles and knowledges that you have learned in other chemistry courses.

IV. Course Goals and Learning Objectives (underlines show alignment with Chemistry Program Learning Outcomes)

By the end of this course, students will be able to...

1. Demonstrate an adequate knowledge base in the molecular modeling and in how to apply the knowledge to chemical problems, including
 - Understand the principles in molecular orbital theory.
 - Possess an adequate knowledge of how molecular properties depend on orbital interactions.
2. Evaluate, analyze, and interpret data to form conclusions, including
 - Perform basic calculations by applying appropriate modeling techniques.
 - Analyze and interpret the calculated data based on chemical and physical principles.
3. Effectively extract and construct scientific meaning from critical reading of primary and secondary literature (scientific research articles, reviews, tutorials, and database)
4. Effectively communicate your ideas through audiovisual presentation

V. Course Prerequisites/Co-requisites

CHEM 3411 (Organic Chemistry 1), CHEM 4521 (Physical Chemistry: Quantum and Spectroscopy); a waiver may be granted by the instructor under special circumstance.

VI. Course Credits

3 credit hours. CHEM 4510 fulfills the chemistry elective requirement for the BS chemistry degree, and CHEM 5510 counts as elective for graduate programs in chemistry.

VII. Required Texts and Materials

Required Texts:

- A **computer** (laptop or desktop): Windows 8.1-11.X or Mac OS 10.12 (Sierra)-12.X (Monterey); Intel, Athlon, or Mx Chip CPUs; 128 GB or more free space hard drive; 4 GB or more RAM; Internet access; and administrator privilege to install programs.
- **SPARTAN-student** to be installed in your laptop/desktop on the first day of class, and the instructor will provide you the license keys. Please make sure that your computer meets the **minimum requirements** listed above before installing the program, because we will not be able to resupply another license key.
- Handouts provided by the instructor

- An external portable hard drive or USB memory key for data backup.

Additional Required Materials, Equipment, or Skills:

- Your laptop should have an either VGA or HDMI port so that you can connect it to the overhead projector for presentation; if not, you may need a convertor.
- Know how to use Office programs, e.g., MS Word, PowerPoint, and Excel, or equivalent
- Know how to use Google (www.google.com)

VIII. Supplementary (Optional) Texts and Materials

- "Computational Organic Chemistry", 2nd Ed. by Steven Bachrach, and published by Wiley, ISBN 1118291921
- "Essentials of Computational Chemistry: Theories and Models", 2nd Ed. by Christopher Cramer, published by Wiley, ISBN 0470091827
- "Modern Quantum Chemistry: Introduction to Advanced Electronic Structure Theory", by Attila Szabo and Neil S. Ostlund, published by Dover, ISBN 0486691861

IX. Course Schedule

The schedule is shown below. The presentation dates for homework and coursework are fixed, while dates for topics are tentative. If changes are necessary, the instructor will notify the students at least 24 hours in advance in the class or via Canvas announcement.

Week	Date	Day	Topics	Assessments/Notes
1	8/20	T	Overview & Computer setup	
1	8/22	Th	Basic & Computer setup	
2	8/27	T	H	
2	8/29	Th	H	Group finalized
3	9/3	T	H	
3	9/5	Th	H ₂ ⁺	
4	9/10	T	H ₂ ⁺	
4	9/12	Th	H ₂ ⁺	HW1
5	9/17	T	H ₂ ⁺	
5	9/19	Th	H ₂	
6	9/24	T	H ₂	
6	9/26	Th	H ₂	HW2
7	10/1	T	H ₂	
7	10/3	Th	H ₂	
8	10/8	T	HO	
8	10/10	Th	HO	HW3
9	10/15	T	HO	
9	10/17	Th	HO	
10	10/22	T	Opt	
10	10/24	Th	Opt	HW4
11	10/29	T	Opt	
11	10/31	Th	Opt	
12	11/5	T	Opt	Coursework project topic decided
12	11/7	Th	Solv	HW5
13	11/12	T	Solv	
13	11/14	Th	Solv	
14	11/19	T	Fall Break, no Class	
14	11/21	Th	Fall Break, no Class	
15	11/26	T	Solv	
15	11/28	Th	Solv	
16	12/3	T	Seminar	Presentation of coursework projects
16	12/5	Th	Seminar	Presentation of coursework projects
17	12/10	T	Finals Week	Final Exam, TBA
17	12/12	Th	Finals Week	

EVALUATION**X. Assignments**

The assignments include homework, coursework project, and final exam.

Working in a Group: Collaboration with people of various backgrounds is essential to modern scientific research, and you will have the chance to such experience in this course.

In this course, students will work in small groups in homework and coursework project (but **not in final exam**). Each group is made of **2** people depending on the course enrollment. A student should get to know the classmates in the first 2 weeks and identify the partners to work with. Please inform the instructor by **3:15 pm, 8/29/2024**. If you are unable to join a group, and the instructor will assign you to a random group. If you have justified reasons that prevent you from working in a group setting, you must let the instructor know by then, and the instructor may approve you working alone in homework.

Each group must elect/appoint a **group coordinator**, who will coordinate the group activities. After taking the position, the group leader should email the list of students in the group by **3:15 pm, 8/29/2024** to the instructor, with other group members copied.

The group coordinator will coordinate the homework activities and be the corresponding person between the group and the instructor (with other group members copied).

Each group member should collaborate with each other with courtesy and help the group leader in the group activities.

The grade of homework is group-based, i.e., all in the group will in principle receive the same grade. However, to be fair, if a student barely contributes to the group efforts, he/she will receive a lower grade than the other group members.

- Homework

There are 5 homework assignments (HW1 to HW5). A homework assignment usually requires the group to practice through tutorial and then use the programs to do similar things with other molecules. Each group will present the results of the homework as a short **(10-20 minutes) talk** in class on the due date. (See the schedule for specific dates). Please make sure that at least one group member's laptop can hook up with the overhead projector via HDMI/VGA connector.

The assessment of a homework assignment is based on **completion in time (9 points)** and **effectiveness in presentation (3 points)**. Effectiveness means that the presentation is given in a clear and organized manner and that you answer in a reasonable manner the questions from the audience. You may do the calculations incorrectly, but that is fine, as you will not lose points for that.

- Coursework Project

Every group will do a coursework project and present the project in an oral format in the class.

Topic of Coursework Project: The instructor provides a list of recommended topics. If the group choose a topic not in the list, please discuss the topic with the instructor. (A **common mistake** is to

pick too difficult and too complicated a project that requires computational time/resources beyond reach in this class.) If you have difficulty in identifying a topic, please talk to the instructor, who will be happy to make suggestions. The topic of the project is to be decided **by 11/5/2024**.

Presentation: Every group will give an oral presentation to talk about the coursework project.

- (1) The presentation is limited to a **25-minute talk** followed by a **5-minute Q&A**. It is recommended that you limit the number of PowerPoint slides to a reasonable number (not counting the title and acknowledgement slides). A rule of thumb is 2-3 minutes per slide. You can do a chalk talk instead of PowerPoint presentation if you prefer.
- (2) The assessment will be **completion and presentation of coursework in time (15 points)** and **effectiveness in presentation (5 points)**. Effectiveness means that the presentation is given in a clear and organized manner and that you answer in a reasonable manner the questions from the audience. You may do the calculations incorrectly, but that is fine, as you will not lose points for that.

- Final Exam

The final exam (**20 points**) is **open-book, open-note, and open-resource**, and will be given **online in Canvas** (date TBA by the university). The exam will mostly be in the form of multiple-choice questions (other forms such as open-ended questions may also be used). The exam will assess if you understand the fundamental concepts. Elaborated numerical evaluations are not involved.

The exam is **individual based**, i.e., you are not doing quizzes in a group setting and will receive your own score.

The exam is **timed**. You have a 24-hour window to do the exam. Once you start the exam, you must complete it within the given time. You have only **one attempt**.

Partial credit is not given for multiple-choice problems. For open-ended questions, the instructor has certain rules for giving partial credits, which will be followed strictly. **No makeup exam will be given**. The missed exam will be given zero.

XI. Extra Points for Making a Chemistry Video

Each student has a chance to earn **up to 6 extra points** for making and posting on YouTube a short (2-4 minutes) video on a specific scientific topic that is related to what we have covered in this course. The goal is to explain the scientific concept or knowledge to general public. The audience is assumed to be at the level of an undergraduate freshman or sophomore, who is taking general chemistry but not necessarily majored in chemistry.

Note that this is completely optional, so you do NOT have to do it. But if you want to earn the extra points, please post your video on YouTube and **email me the link to your video and a headshot of you** (so that I can verify that the person in the video is indeed you) before the last week of the semester (**before 12/7/2024 Saturday**).

Examples of previous videos (from other classes):

- <https://www.youtube.com/watch?v=CIO67x5Ktb0&feature=youtu.be>
- <https://www.youtube.com/watch?v=WmPo4bMkaV0&feature=youtu.be>
- https://www.youtube.com/watch?v=Oi_cC1utcpw

- <https://www.youtube.com/watch?v=GzIEC76zBjM&feature=youtu.be>
- https://www.youtube.com/watch?time_continue=4&v=tXUDqsFH81c&feature=emb_logo
- https://www.youtube.com/watch?v=-UxEeBKkPmA&feature=emb_logo
- <https://youtu.be/Z4qfFwHLg3E>
- https://www.youtube.com/watch?v=DZP3_Sxv2WU
- <https://www.youtube.com/watch?v=7ifywnHpT7M&feature=youtu.be>
- <https://youtu.be/jDz7QHh0r9s>
- https://www.youtube.com/watch?v=iprecPTFMbA&ab_channel=MinhLe
- <https://youtu.be/lHjWsYMjkc>
- https://www.youtube.com/watch?v=lr_vuxx8BnA
- https://www.youtube.com/watch?v=HKKo7_dHyVo
- <https://www.youtube.com/watch?v=Y1bsqizxHml>
- <https://www.youtube.com/watch?v=CWETA1-TKR0&t=15s>
- <https://www.youtube.com/watch?v=BWKk19z9IRQ>
- https://youtu.be/xLjwWiWhz_c
- <https://youtu.be/nD06dryoM3Y>
- <https://youtu.be/BGvhro2J4tQ>
- <https://youtu.be/X4SPxXmrQjc>
- <https://www.youtube.com/watch?v=1sc2BNZvtI8>
- <https://www.youtube.com/watch?v=l6qe7Xyy3Ng>
- https://youtu.be/9d7YkN_-dME
- <https://youtu.be/0zIX29z5IGA>
- <https://youtu.be/CZMBnARNgUA>
- <https://youtu.be/6tw5SaYcVs4>
- <https://youtu.be/LSD2o2FpRv8>
- <https://youtu.be/aKwpZtHzjSw>
- <https://youtu.be/Zg6fHw8Z-8M>

Suggested example topics are:

- Introduction of my favorite element (or molecule)
- What can you buy with one mole of US dollar?
- How much energy is needed to cook a patty for hamburger?
- Do you know the most spicy/bitter/sweet compound?
- How can you find out the volume of a single water molecule?
- What is ^{14}C and why is it useful?
- Which compounds are used as flame retardant and how do they work?
- What are the challenges to recycle solar panels?
- What are the differences between baking soda and baking powder?
- How are cheeses made?
- What are in a glass of wine (or beer or other drinks)?
- What is nylon and why is it useful?
- What are the challenges to use biofuel?
- What are the differences between windshield glass and the glass used to make a beaker?
- What might be the concentrations of greenhouse gases and the temperature of the earth right after the bolide that hit the earth 66 million years ago?
- What is glyphosate?
- How does a battery work?

You are welcome to discuss your topic choice with the instructor.

While there are no limits in the format or contents that you present in the video, please **restrict the stuff to science** in the video. Furthermore, please make sure that your video **does not violate the laws and does not contain immoral stuff**. Anyway, no one wants to get into troubles...

You may get some ideas on what and how to present in the video from various resources including online resources. However, make sure that you **use and cite those resources appropriately**. You do not want to be sued for plagiarism, do you?

If students **work in groups** for the video production, the 6 extra points will be divided and given to the involved students. For example, if two students work together to make a video, each student will receive 3 points.

I am happy to help you in this video production; however, to be fair to all students in the class, my role as the instructor must be limited to offering advice on topic selection.

You as the author of the video retain the **copyright** of the video (e.g., you post it on YouTube and other places like Facebook and invite family, friends, coworkers, and classmates to like it); but you agree that the instructor may use your video, with adaptations (e.g., to correct mistakes, if any), for educational purposes (e.g., showing your fantastic video to other students, faculty, or general public). The instructor will not use your video for commercial purposes.

XII. Basis for Final Grade

Grading will be based on the assignments (excluding homework).

Assessment	Points per Occurrence	Number of Occurrences	Total Points Possible	Percent of Final Grade
Homework	12	5	60	60%
Coursework	20	1	20	20%
Final Exam	20	1	20	20%
			100	100%

Grading scale is based on percentage, which is shown below.

Grading Scale (%)	
[92, +∞)	A
[90, 92)	A-
[88, 90)	B+
[82, 88)	B
[80, 82)	B-
[78, 80)	C+
[72, 78)	C
[70, 72)	C-
[68, 70)	D+
[62, 68)	D
[60, 62)	D-
[0, 60)	F

The instructor may or may not curve the accumulated grades, depending on the overall performance of the class. The curving may or may not improve your grade, but it will not lower your grade.

XIII. Grade Dissemination

Your grades of the assignments can be found via the course's Canvas course shell. You can access your scores at any time within the Canvas Gradebook. Final grades are posted via UCDAccess at the end of the semester.

According to the University's interpretation of the Family Education Rights and Privacy Act (FERPA), your instructors are not allowed to discuss grades via email, as it is not considered a secure means of communication. However, I can discuss your grades via email if you include the following disclaimer in your email to me: **"I understand that email is not a secure means of communication and give you permission to discuss my grade via email."**

COURSE PROCEDURES

XIV. Course Policies: Grades

If you have questions about your grades, please contact the instructor with a *written statement* within *one week* after the grades are posted for the specific homework assignments or quizzes, include the following disclaimer in your email: **"I understand that email is not a secure means of communication and give you permission to discuss my grade via email."**

Attendance Policy

Students are expected to attend lectures and actively participate in the class discussions. UC Denver Student Attendance and Absences Policy can be found at http://www.ucdenver.edu/faculty_staff/employees/policies/Policies%20Library/OAA/StudentAttendance.pdf

Late Work Policy

No late assignment will be accepted. It will be given zero.

Extra Credit Policy

Apart from the extra points for the chemistry videos, extra points may be earned in a test that has extra problems. These extra problems are related to the materials you learned in this course and may or may not require advanced understanding. However, as far as I know, Canvas does not distinguish between regular and extra points in a test. For example, if you earn 19 regular and 1 extra points in a test that offers 20 regular and 1 extra points, your grade should be $20/20 = 100\%$; but Canvas will likely show it as $20/21 = 95\%$. This may cause some confusion, but I will make sure that your grade is properly calculated at the end of the semester.

Grades of "Incomplete"

The current university policy concerning incomplete grades will be followed in this course. Incomplete grades are given only in situations where unexpected emergencies prevent a student from completing the course and the remaining work can be completed the next semester. The instructor is the final authority on whether you qualify for an incomplete. Incomplete work must be finished by the end of the subsequent semester or the "I" will automatically be recorded as an "F" on your transcript.

Rewrite/Resubmit Policy

No rewrites or resubmission will be accepted.

Group Work Policy

See the group work described in Section "Assignment".

xv. Course Policies: Technology and Media**Email**

One of the requirements for this course is that you maintain an email address, check it regularly for messages, be sure it is working, and notify the instructor in time if you change your email address. Official university communication is only sent via a student's university email address. Normally, you are responsible for any messages the instructor send to you via email 24 hours prior. You may contact the instructor via email, in addition to phone calls and seeing the instructor during office hours. The instructor will answer emails as quick as possible (usually within 24 hours), but delays may be expected during weekends and breaks, when the instructor is traveling or on sick leave, and in other special situations (e.g., the university email server is down).

While email is a convenient tool, please do not abuse it. Please limit the contents to stuff related to this course and to academic purpose. **Please indicate explicitly your name, student ID, and the course title in the email**, which will help the instructor to quickly locate the necessary information when replying. The instructor may request you to meet in person if your questions can not be answered via email (e.g., per the university's policy, no grades can be disseminated via email) or are difficult to answer via email (e.g., your question requires extensive discussion).

Canvas

This course will use the Canvas course management system. You should automatically be registered for access to the course site. You should check your Canvas account regularly. The syllabus for the course is listed there. Your grades will be posted to your personal page, so you will know your standing and can correct any clerical errors with ease. The instructor may also post notes on Canvas.

You can log into Canvas at <https://ucdenver.instructure.com/login>. If you have any problems with the online system, please contact the Help Desk immediately. The instructor does not have any authority in managing your account.

Laptop and Mobile Device Usage

Please make sure that you have Internet connection so that you can use the Canvas course shell and receive/send emails. You are required to have access to computers that can be used for the course (homework, coursework project, and online test). Please ask the instructor for permission before using recording devices (e.g., to record a lecture or meeting). Note that laptops and mobile devices are used in the class only for this course and for academic purpose, and that the use of them must not cause disturbance to the instructor or other students.

Classroom Devices

A computer (laptop or desktop) is required. See the required text and materials section.

Library-supplied online databases and collections

If you need to use the library for further information (e.g., dictionaries and references), please contact the library staff. The Auraria library website is at <http://library.ucdenver.edu/>.

Classroom Response Clickers

This course does not use student response devices such as clickers. However, you are expected to actively participate in the classroom discussion.

XVI. Course Policies: Student Expectations**Civility**

Everyone must be treated with respect and courtesy both in class and after class. Everyone must commit to create a climate for learning characterized by respect for each other. As your instructor, I never discriminate students on the basis of race, color, national origin, pregnancy, sex, age, disability, creed, religion, sexual orientation, gender identity, gender expression, veteran status, political affiliation, or political philosophy. I hope that you do the same.

Professionalism: Disruptive behavior is not tolerated; this includes using foul language, threatening others, talking about things irrelevant to the course in emails or during the Zoom meeting, etc. Anyone who disrupts the learning environment will be reported to the university.

Late Arrivals, Early Departures, Absence

Students are expected to attend the class on time. This is especially important for the days when the seminar presentations are given. On the other hand, it is understandable that sometimes you may have to arrive late, depart early, or miss a class. If you do have to arrive late, depart early, or miss a class due to justified reasons, notify the instructor in a timely manner with appropriate documentation (e.g., a note written and signed by your doctor or parents if you are sick).

Auraria Library

The Auraria Library offers many services, research databases, and collections. A list of specific librarian contact and/or library subject expert web page can be found at <http://library.auraria.edu/services/researchhelp/specialists>.

Writing Center

The Writing Center website is

<http://www.ucdenver.edu/academics/colleges/CLAS/Centers/writing/Pages/TheWritingCenter.aspx>

Tutor

No tutoring service is provided by the instructor.

Religious Observances

You must notify the instructor at least 24 hours in advance of conflicts between the normal class schedule and major religious observances if you intend to miss class to observe a holy day of your religious faith.

Student Grievances

Student complaints about this course or instructor should be communicated directly to the instructor. If the issues cannot be resolved, you should meet with the chairperson of the Chemistry Department. Contact 303-315-7650 to arrange a meeting. If meeting with chairperson does not resolve the issues, you may appeal to the Associate Dean of Student Success in the Office of the CLAS Dean (NC 5014, 303-315-7000). The decision of the Associate Dean is final. You may also meet with the CU Denver Ombudsman to ask for assistance. For additional information, please see the CLAS policy "Procedures for Student Grievances about Courses or Faculty" available from the Office of the CLAS Dean.

Link to University Policy on Service Animals

<http://equity.ucdenver.edu/wp-content/uploads/2017/02/Service-Animal-Policy-FINAL-DRAFT-2016-11-30.pdf>

University Requirements for Campus Safety: Although this is an online course without on-campus component, you should review the latest required safety protocols (<https://www.ucdenver.edu/coronavirus/>) and follow the recommendations of the CDC, Colorado Department of Public Health and Environment, and the University. I wish everyone safe and healthy, because otherwise you will not be able to learn chemistry!

UNIVERSITY POLICIES

The University of Colorado Denver is committed to maintaining a positive learning, working, and living environment. As such, the University does not discriminate on the basis of race, color, national origin, pregnancy, sex, age, disability, creed, religion, sexual orientation, gender identity, gender expression, veteran status, political affiliation, or political philosophy in admission and access to, and treatment and employment in, its educational programs and activities. (Regent Law, Article 10).

XVII. Access**Disability Access:**

The University of Colorado Denver is committed to ensuring the full participation of all students in its programs, including students with disabilities. If you have a disability or think you have a disability and need accommodations to succeed in this course, I encourage you to contact Disability Resources and Services (DRS) and/or speak with me as soon as you can. (DRS is located in Academic Building 1, Suite 2116, and at disabilityresources@ucdenver.edu.) I am committed to providing equal access as required by federal law, and I am interested in developing strategies for your success in this course.

DRS require students to provide current and adequate documentation of their disabilities. Once a student has registered with DRS, DRS will review the documentation and assess the student's request for academic accommodations in light of the documentation. DRS will then provide the student with a letter indicating which academic accommodations have been approved.

XVIII. Academic Dishonesty**Student Code of Conduct**

Students are expected to know, understand, and comply with the ethical standards of the university, including rules against plagiarism, cheating, fabrication and falsification, multiple submissions, misuse of academic materials, and complicity in academic dishonesty. For suggestions on ways to avoid academic dishonesty, please see the Academic Honesty Handbook at

http://www.ucdenver.edu/faculty_staff/faculty/center-for-faculty-development/Documents/academic_honesty.pdf

Plagiarism is the use of another person's ideas or words without acknowledgement. The incorporation of another person's work into yours requires appropriate identification and acknowledgement. Examples of plagiarism when the source is not noted include: word-for-word copying of another person's ideas or words; the "mosaic" (interspersing your own words here and there while, in essence, copying another's work); the paraphrase (the rewriting of another's work, while still using their basic ideas or theories); fabrication (inventing or counterfeiting sources); submission of another's work as your own; and neglecting quotation marks when including direct quotes, even on material that is otherwise acknowledged.

Cheating involves the possession, communication, or use of information, materials, notes, study aids, or other devices and rubrics not specifically authorized by the course instructor in any academic exercise, or unauthorized communication with any other person during an academic exercise. Examples of cheating include: copying from another's work or receiving unauthorized assistance from another; using a calculator, computer, or the internet when its use has been precluded; collaborating with another or others without the consent of the instructor; submitting another's work as one's own.

Fabrication involves inventing or counterfeiting information—creating results not properly obtained through study or laboratory experiment. Falsification involves deliberate alteration or changing of results to suit one's needs in an experiment or academic exercise.

Multiple submissions involves submitting academic work in a current course when academic credit for the work was previously earned in another course, when such submission is made without the current course instructor's authorization.

Misuse of academic materials includes: theft/destruction of library or reference materials or computer programs; theft/destruction of another student's notes or materials; unauthorized possession of another student's notes or materials; theft/destruction of examinations, papers, or assignments; unauthorized assistance in locating/using sources of information when forbidden or not authorized by the instructor; unauthorized possession, disposition, or use of examinations or answer keys; unauthorized alteration, forgery, fabrication, or falsification of academic records; unauthorized sale or purchase of examinations, papers, or assignments.

Complicity in academic dishonesty involves knowingly contributing to or cooperating with another's act(s) of academic dishonesty.

Academic integrity is fully expected. **An act of Academic Dishonesty may lead to sanctions including a reduction in grade (up to and including a permanent F for the course).**

Students Called for Military Duty

If you are a student in the military with the potential of being called to military service and /or training during the course of the semester, you are encouraged to contact your school/college Associate Dean or Advising Office immediately.

xix. CLAS Policies and Deadlines

For relevant university deadlines and procedures (such as the last day to withdraw from a course) as well as academic support sites, please see this website

https://clas.ucdenver.edu/faculty-staff/sites/default/files/attached-files/student_services_and_calendar.pdf.

xx. Health and Wellness

The University of Colorado Denver is committed the health and well-being of all students. As a student, you may experience a range of challenges that can interfere with learning, such as strained relationships, traumas, increased anxiety, substance use, feeling down, difficulty concentrating, and/or lack of motivation. These mental health concerns or stressful events may diminish your academic performance and/or reduce your ability to participate in daily activities. If you or someone you know is struggling, you can find supportive campus and community resources at <https://www.ucdenver.edu/counseling-center> or by calling the CU Denver Counseling Center (303-315-7270) or the Health Center at Auraria (303-615-9999). On weekends, holidays, or after-hours, you can contact the 24/7 Mental Health Crisis and Victim Assistance Line at 303-615-9999 or text Talk to 38255.

xxi. Early Action Statement

Succeeding at college does not mean that you don't struggle in classes or during particular semesters. Our goal at CU Denver is to do all we can to support students and facilitate their success. Early Action (*Course Progress Report: CPR*) is one of the ways we support our students. It's a process by which individual courses can link you to campus supports and it's a time for your instructors to let you know what changes you can make toward success in the course and engage in a learning partnership with you. This is a way to open up the conversation between you and your instructor so that together you can work out how to achieve your goals in the course. Getting an Early Action is not an indication that you will not succeed in the course. It is a call to action. You might get an email or phone call. Please engage this process. Students who have taken advantage of resources offered them are able to move forward and succeed.

Student Success

The secret of success in this course is very simple: **working hard**.

- **How many hours per week do I needed to spend on study for this course?** It depends on many things. This course has a lot of homework assignments, which can take a lot of time especially if you are not familiar with computer. However, as you practice more, you will get more and more proficient, and the time needed will hopefully reduce.
- **How to do the homework assignments?** Working in group, trial and error, and Google.
- **How should I work in a group setting?** This is not an easy question to answer. It depends on many things and varies from case to case. My suggestions are:
 - Be courteous to everyone in the group.
 - Explicitly specify the task each person in the group will be responsible for and the corresponding due date & time.
 - Establish a procedure to resolve problems, delays, conflicts etc., should they come up.
 - Prepare yourself for the group meeting; or you are wasting everyone's time.
 - When in doubt, discuss openly (and with respect) with other group members and the group coordinator who oversees the progress and takes actions when needed.

Appendix A: Academic Dishonesty and CLAS Academic Ethics Policy

Students are expected to know, understand, and comply with the ethical standards of the University. A university's reputation is built on a standing tradition of excellence and scholastic integrity. As members of the University of Colorado Denver academic community, faculty and students accept the responsibility to maintain the highest standards of intellectual honesty and ethical conduct.

Academic dishonesty is defined as a student's use of unauthorized assistance with intent to deceive an instructor or other such person who may be assigned to evaluate the student's work in meeting course and degree requirements.

Examples of academic dishonesty include, but are not limited to, the following:

A. Plagiarism: Plagiarism is the use of another person's distinctive words or ideas without acknowledgment. Examples include:

1. Word-for-word copying of another person's ideas or words;
2. The mosaic (the interspersing of one's own words here and there while, in essence, copying another's work);
3. The paraphrase (the rewriting of another's work, yet still using their fundamental idea or theory);
4. Fabrication of references (inventing or counterfeiting sources);
5. Submission of another's work as one's own;
6. Neglecting quotation marks on material that is otherwise acknowledged

Acknowledgment is not necessary when the material used is common knowledge.

B. Cheating: Cheating involves the possession, communication, or use of information, materials, notes, study aids or other devices not authorized by the instructor in an academic exercise, or communication with another person during such an exercise. Examples include:

1. Copying from another's paper or receiving unauthorized assistance from another during an academic exercise or in the submission of academic material;
2. Using a calculator when its use has been disallowed;
3. Collaborating with another student or students during an academic exercise without the consent of the instructor

C. Fabrication and Falsification: Fabrication involves inventing or counterfeiting information, i.e., creating results not obtained in a study or laboratory experiment. Falsification, on the other hand, involves the deliberate alteration of results to suit one's needs in an experiment or other academic exercise.

D. Multiple Submissions: This is the submission of academic work for which academic credit has already been earned, when such submission is made without instructor authorization.

E. Misuse of Academic Materials: The misuse of academic materials includes, but is not limited to, the following:

1. Stealing or destroying library or reference materials or computer programs;
2. Stealing or destroying another student's notes or materials, or having such materials in one's possession without the owner's permission;
3. Receiving assistance in locating or using sources of information in an assignment when such assistance has been forbidden by the instructor;

4. Illegitimate possession, disposition, or use of examinations or answer keys to examinations;
5. Unauthorized alteration, forgery, or falsification;
6. Unauthorized sale or purchase of examinations, papers, or assignments

F. Complicity in Academic Dishonesty: Complicity involves knowingly contributing to another's acts of academic dishonesty. Examples include:

1. Knowingly aiding another in any act of academic dishonesty;
2. Allowing another to copy from one's paper for an assignment or exam;
3. Distributing test questions or information about the materials to be tested before the scheduled exercise;
4. Taking an exam or test for someone else;
5. Signing another's name on attendance roster or on an academic exercise

Students who fail to comply with the UC Denver CLAS Academic Ethics Policy are subject to disciplinary action as set forth by the College policy. For more information regarding the Academic Ethics Committee policies and procedures, please refer to

<http://ucdenver.edu/academics/colleges/CLAS/faculty-staff/policies/Pages/HandlingAcademicDishonesty.aspx> .

Appendix B: CLAS and Chemistry Department Withdrawal Policy as Established in Fall 2017**CLAS Withdrawal Policy**

- From the first day of classes until the Sunday at the start of the 11th week of the semester, students may withdraw using the UCD Access student portal. No signatures or permissions are required. Courses that serve as a co-requisite for another course may not be dropped unless both courses are dropped. This co-requisite rule is now enforced campus-wide and the Registrar's office will not under any circumstance break a co-requisite prior to week 11.
- From Monday of the 11th week through Friday of the 14th week of the semester, students who wish to withdraw must follow the CLAS Late Withdrawal Policy. The CLAS Dean's office has indicated that the policy will:
 - Require signatures from the instructor and a CLAS advisor or dean.
 - Allow students to withdraw during this period for any reason, including poor performance.
 - Allow for co-requisites to be broken.
- After the Friday of the 14th week of the semester students must submit a retroactive withdrawal petition which requires detailed documentation. Poor or failing grades are not typically a valid reason for a retroactive withdrawal. Retroactive withdrawal requests will not be considered until the following term.

Chemistry Department Policy for Withdrawals

- Students who wish to withdraw from a chemistry course beginning Monday of the 11th week through Friday of the 14th week of the semester will be allowed to do so. Students must follow the CLAS Late Withdrawal Policy which requires the signature of the instructor and a CLAS advisor or dean.
- Beginning Monday of the 11th week through Friday of the 14th week of the semester, students can drop a course that serves as a co-requisite for another course without having to drop both courses. That is, *the Chemistry Department will allow co-requisites to be broken after the 10th week of the semester is completed.* This applies to all co-requisite courses (listed below) in the chemistry department.

Chemistry Courses requiring a co-requisite course:

- Course CHEM 2038 has the co-req CHEM 2031 or CHEM 2081
- Course CHEM 2068 has the co-req CHEM 2061 or CHEM 2091
- Course CHEM 2088 has the co-req CHEM 2031 or CHEM 2081
- Course CHEM 2098 has the co-req CHEM 2061 or CHEM 2091
- Course CHEM 3011 has the pre-req/co-req CHEM 3421 or CHEM 3491
- Course CHEM 3018 has the pre-req/co-req CHEM 3011
- Course CHEM 3118 has the co-req CHEM 3111 or CHEM 3481
- Course CHEM 3418 has the co-req CHEM 3411 or CHEM 3481
- Course CHEM 3428 has the co-req CHEM 3421 or CHEM 3491
- Course CHEM 3481 has the co-req CHEM 3418 or CHEM 3488
- Course CHEM 3488 has the co-req CHEM 3411 or CHEM 3481
- Course CHEM 3498 has the co-req CHEM 3421 or CHEM 3491
- Course CHEM 4121 has the co-req CHEM 4128 for chem majors
- Course CHEM 4128 has the co-req CHEM 4121
- Course CHEM 4511 has the pre-req/co-req MATH 3511 or CHEM 4500 (effective Spring 2018)
- Course CHEM 4518 has the co-req CHEM 4511
- Course CHEM 4521 has the pre-req/co-req MATH 3511 or CHEM 4500 (effective Spring 2018)
- Course CHEM 4538 has the co-req CHEM 4521
- Course CHEM 4548 has the pre-req/co-req CHEM 4511 and CHEM 4521
- Course CHEM 4810 has the pre-req/co-req CHEM 3421 or CHEM 3491 (effective Spring 2018)
- Course CHEM 4815 has the co-req PHYS 2020 or PHYS 2331

Appendix C: Diversity and Inclusion Statement by the Chemistry Department

As a unit that teaches and explores, arguably, one of the most diverse topics within the sciences, the Department of Chemistry at CU Denver affirms the importance of reaching out to involve every person in the scientific and science education enterprises. As our campus' population reflects more the diversity that makes the city of Denver rich and prosperous, there is much work that needs to be done to achieve this quality in most STEM fields, not only within our campus but also beyond.

We want to emphasize that the Chemistry department values diversity and inclusion as qualities that make us stronger, wiser, and more impactful. By sticking to these core values, we believe that we can better address and solve the most pressing problems of our society while sharing our knowledge with our student population and beyond. By actively considering the voices of all people, regardless of their nationality, sexual orientation, gender, religious beliefs, cultural background, veteran status, disability, race, or skin color, we are sure that our decisions in the types of problems we decide to tackle, and how they are addressed, can result in a positive impact on our communities.

Since the early days of our campus in the 1960s, our department has worked with students considered as 'not traditional'; such as first-generation students, students holding jobs to support themselves and their families, students interested in re-starting their careers after years of involvement in other activities, students starting families, and much more. Six decades later, and with a much different campus, we continue to serve these populations, understand their challenges, and are proud to see them leave CU Denver with more tools to be successful in their next academic/professional step. As the campus population evolves, we are eager to continue working with traditional and non-traditional college students of all backgrounds.

We believe that the scientific enterprise and the concepts of diversity and inclusion are not separate. On the contrary, working with these values to understand and solve the scientific challenges that we are pursuing, will ensure our success. Just as important, their application in the classroom setting (virtual or in-person) will result in a positive and welcoming environment for everyone involved (student, TA, LA, instructor, etc.).

Our department extends an invitation for everyone to contribute to learning and doing chemistry, whether in the classroom or in the laboratory, everyone is welcome in chemistry spaces. We strongly believe that these values will positively influence the future leaders arising from CU Denver.