

**CHEM F100X UX1**  
**Chemistry in Complex Systems, 4 cr**  
Spring 2025

Instructor: Chris L. Whittle, Ph.D.

Office Hours: Fridays 5:30-6:30 p.m.

Email: [clwhittle@alaska.edu](mailto:clwhittle@alaska.edu)

Telephone: 907-687-7833

I will be available at this number and by email during office hours, but you are welcome to contact me via email at other times and I will respond as soon as possible. When contacting me by email, include: Chem 100X and the subject (e.g., Lab 1) in the subject line.

### **Course Description**

This class explores the fundamentals of chemistry with an emphasis on the molecular activity driving global phenomena and place-based connections drawn to Alaska. Principles such as molar ratio and feedback are illustrated as chemistry is applied to understanding the essential ecosystem services of air, water, food, materials, and energy. Prerequisites: placement in ENGL F111X or higher; placement in DEVM F105 or higher; or permission of instructor.

### **Course Philosophy**

As we attempt to navigate toward sustainability in an increasingly technological world, citizens need to understand basic chemical and biochemical sciences within the context of complex natural systems. Chemistry and biochemistry are central to resilience and sustainable development, and the essentials are not that difficult to understand. The textbook and other course materials are designed to engage you in chemistry by studying the real-world issues of pollution, climate change, combustion, natural resources, and drug and food technology. We will focus on what you need to know to understand and evaluate the implications of the chemistry behind social and economic decisions, today and in the future. The philosophy of breadth core-courses is to show the connections between science and society, and how the scientific method is part of a holistic system of decision-making that also includes socioeconomic considerations.

### **Course Objectives**

The overall objective of this class is to provide you with a basic literacy of chemical and biochemical principles, which requires: knowledge of historical aspects of chemistry; an essential understanding of the structure of matter and molecular activity that underlie and helps explain complex systems; an appreciation for the similarities and differences between science

and other ways of knowing; an ability to describe and explain essential scientific issues that confront us as citizens, including the limitations of science.

The specific goals are for you to become familiar with: 1) the methods and principles of science used by chemists and biochemists; 2) major concepts of chemistry such as conservation of matter, chemical reactions, pH, carbon chemistry, nutritional biochemistry, etc.; 3) the role of uncertainty, hypothesis testing, and weight of evidence in environmental issues; 4) the scientific value of traditional knowledge.

We want you be able to discuss the following, using the language of general chemistry:

- Context and action relating science to policy on real issues;
- The scientific method, including study design and uncertainty;
- Sustainability;
- The structure of matter;
- Guiding principles of chemical behavior, such as solubility, valence, and molarity.

### **Core Science Class**

This is a Natural Science course approved for inclusion in the UAF Core Curriculum, where "The overall goal of the Natural Sciences component of the Core Curriculum is to prepare students for lifelong learning in the natural sciences..." [Faculty Senate Guidelines, 1990]. In partial fulfillment of this objective and in addition to the specific course program outlined in this syllabus and the UAF Catalog, you will receive instruction in two areas. The first is on what is generically known as the "scientific method," for which you can experience alternate approaches within different academic departments. A good primer can be found in Wikipedia's introductory paragraph on the "scientific method." Second, you will discuss within the course examples where there is interplay between scientific knowledge and public policy, where knowledge and policy can be established and/or developed. A short title could be "Science and Society." These examples should sharpen your abilities to recognize when scientific knowledge is applicable to a public/societal issue and to broaden your understanding of the scientific contributions. By way of a recent local example, how does the scientific literature concerning health effects of fluoridated water affect decisions to alter the fluoride content of municipal water? The "scientific method" and "science and society" are the two Core expectations identified for the Core Natural Science courses and are the expectations for which this course is assessed as part of the mandatory Student Learning Outcomes Assessment.

### **Required Materials**

Lab Kit

Lab Manual and supplementary readings are contained within Canvas.

*Chemistry in Context*, 10th Edition (American Chemical Society)

This nationally designed text is part of the "Science Education for New Civic Engagement and

Responsibility” curriculum approach. While there is less memorization of chemical facts, there is more thought about how the science is part of everyday life and policy. The text is organized into several sections based on current social and political issues. The ecosystem services of air, water, food, and energy provide a relevant framework to define chemical language and describe matter while illustrating basic chemical concepts that allow us to understand and evaluate the biosphere.

You may purchase your materials through the UAF-Barnes and Noble Bookstore  
order online - <https://uaf.bncollege.com/>

Constitution Hall, Suite 209, 1692 Tok Lane, Fairbanks, AK 99775

Phone: 907.474.7348 Email: [sm8514@bncollege.com](mailto:sm8514@bncollege.com)

### **Tips for success / Instructional Methods**

Study by distance requires diligence! Without a class, there is no opportunity for a lecture to review material and it is essential that you make time to focus on assignments. You are expected to spend about 12 hours on this class each week. The course uses a variety of methods, but **READING** will provide most of the content.

Each weekly module is made up of several components. There will always be a screen-cast (a short power-point presentation with an audio voice-over) to emphasize the critical points in the weeks reading. The longer “full power point” with no voice-over should be reviewed and used for studying. Most of the following are also included each week: a discussion board posting, a self-assessment, homework, a pre-lab podcast a laboratory exercise, and a quiz or exam.

Of the 12 hours you spend thinking chemistry, you should plan at least 4 for the screencast and reading, 3 for doing the lab, 2 for homework, and up to 1 each for the discussion post, self-assessment, and quiz or exam.

### **Grading Scheme**

Item	Points each	Total	%
9 quizzes	10	90	9
Post-course survey	10	10	1
4 exams	77.5	310	31
7 pre-labs	10	70	7
6 labs	15	90	9
3 labs	30	90	9
14 homework	10	140	14
14 discussion posts	10	140	14
3 self-assessments	10	30	3

1 essay	30	30	3
		1000	100 %

The grades will not be curved but attitude counts and can make the difference for a borderline final-grade. Letter grades will be assigned with the following approximate cutoffs, although they may be granted with up to 10 points if strong effort is demonstrated (homework done, questions asked, resources used).

A+  $\geq$  970 > A  $\geq$  930 > A-  $\geq$  900  
 B+  $\geq$  870 > B  $\geq$  830 > B-  $\geq$  800  
 C+  $\geq$  770 > C  $\geq$  730 > C-  $\geq$  700  
 D+  $\geq$  670 > D  $\geq$  630 > D-  $\geq$  600  
 F < 600

I INCOMPLETE See below for information on an emergency extension to complete the class

NOTES:

A “C” is required if the class is to be used as a pre-requisite for another class.

Progress Reports will be based upon work completed and graded before the reporting date (October 7th), which should include the first 3 labs, 3 quizzes and an exam.

Engagement from the beginning is a strong indicator of success in the class:

- Your first contact (Discussion post) is due the first week of instruction. Failure to submit this assignment within the first week of class may result in being dropped from the course.
- The first content assignment (pre-course survey) is also due within a few days of the first day of instruction. Failure to submit the first week of the course may result in being dropped from the course.
- Failure to submit at least 4 labs, 4 quizzes, and 2 exams by the deadline for Faculty-Initiated withdrawals (November 1st) may result in Faculty-Initiated withdrawal from the course (W).

## Weekly Schedule

Readings should be done early in the week. The discussion board posting and pre-lab (usually a preview of the lab materials and a short preparatory activity) are due Thursdays by 11:59 p.m. Most work is due on the Monday of the week by 11:59 p.m. Check the Course Calendar for special due dates that are notated in blue.

You are expected to spend at least 12 hours a week on this class. If you do, and you plan and use that time well, you will almost certainly pass the class. It will probably take more like 15 hours a week to earn an A.

## Reading the content!

It is critical to passing online classes that you read the text. When you sit down to read, look over the writing before you begin. Read the first page, and then through the headings and captions. Think about the tables and what you think they mean. Read the summary at the end. Then read the chapter, taking notes and trying the examples and problems in the margins or your notebook as you go. Always carry units! Numbers don't mean anything without the identity of the item or event being counted or measured.

Additional resources (usually websites) will be offered in the weekly screen-casts to provide additional context for the material. Optional links will always be labeled with **IYW** (if you want). More are offered than you are expected to explore so that you can pick and choose among them. The IYW links provide additional information that might be of interest or be useful as an example in essay questions. **If a link is not labeled IYW, you are expected to 'go there' and the material may appear on a quiz or exam.**

### **Homework (14 x 10 = 140 points)**

Problems from the "Exercises" section at the end of each chapter will help you prepare for quizzes and exams. The solutions to most of these questions are in the back of your book. You'll be asked to turn in a few that you can't check yourself. Working with a pencil and paper is highly preferable to trying to type out equations and formulas. Answers to homework problems should be supported by examples, precision counts. Always show your work (even if you give the incorrect answer but you show your work, partial credit is usually given). Scanned work should be submitted in Canvas. Much of the quiz and exam material will be modeled after the homework so doing the assignments is key to success!

### **Discussion posts (14 x 10 = 140 points)**

The discussion posts are an opportunity for you all to get to know each other and also to relate the material to your everyday world. You will each pick-up on different aspects of the material and relate it to your own life differently. Learning from each other's unique perspectives is an important aspect of this class. A discussion question will be posted each week.

You can earn up to 7 points for your first post (due by Thursdays) and 3 points for an additional comment or response to classmates (due by Mondays). **Posts submitted on the same day count as one post.** Your comments need not be long, but should be thoughtful and should help the rest of us get to know your community and local manifestations of chemical concepts. General guidelines for grading are as follows:

#### **Points Original Post (7 pts)**

- 3 demonstrates your understanding of a chemical concept under study
- 2 local (to global) examples / relevance / manifestations / perceptions of the concept
- 2 clear concise writing

#### **Comments and additional Responses (3 pts)**

- 3 contributes to others' understanding with a new idea or a good resource (include description and how it's useful / why it is relevant, not just a link)

### **Self-Assessment (3 x 10 = 30 points)**

You are asked to assess your performance in the class 5 times during the semester: one or two sentences will not earn full points. This is an opportunity for you to make sure that you are on-track and reaching the goals that you have set for this class, as well as, your academic and professional careers.

Reflect on how you are applying what you are learning to your own experiences, interests, profession, job, or to the things you do in daily life. You may also reflect on how much time you are spending on the class materials and how much you are participating in the class (Note: that reflections that only address these kinds of topics will not earn full points).

### **Scientific Essay/Community Perspective: 45 points total (15 as lab grade for outline)**

A short scientific essay (750 < words < 1000) is due near the end of the term. Given the demands of science, you are not expected to conduct experimental research. Rather, the essay should explore a hypothesis that is supported or refuted with evidence and examples, including your own observations. There is more information on the assignment in LAB 9.

### **Quizzes & Exams (9 x 10 points + 4 x 77.5 points = 400)**

All exams and quizzes are required. There will be 9 (15 minute) quizzes (10 points each) covering the previous week's material. Two 1-1/4-hour exam, and two 1-hour exams (4 x 77.5 points) will cover material from textbook chapters as well as associated concepts from the laboratory. All the exams are cumulative, in the sense that information from prior sections will be essential as you deepen your knowledge. Both quizzes and exams are OPEN book. Please refrain from using the Internet to answer questions and only use the Textbook as your sole reference.

### **Lab (6 x 15 = 90 points + 3 x 30 = 180 points)**

You will be asked to purchase a take-home chemistry kit.

Each week that there is a lab, there is usually a pre-lab. Watching an introductory podcast that will help you complete the lab is part of the pre-lab, which also includes reading the lab, previewing the podcast, and making sure you have all the right materials. The pre-lab usually includes some activity that will help you prepare for the actual lab. The overall objective of the lab experience is to allow you to become familiar with the processes of the scientific method: measuring, comparing, and analyzing data. The labs get more difficult through the term and some require a full lab report: an original write-up of your objectives, experimental procedure,

and findings. Experimentation is a critical part of the scientific method, and the laboratory portion of your grade is essential to getting credit for the class.

Labs 6, 7 and 8 require a lab write-up that must follow the format and instructions provided in the Lab Report Format document. Feedback may be provided beginning with Lab 6. Feedback that has been provided for Lab 6 should be incorporated into Lab 7 or 2 points will be deducted for each item that has not been corrected. For Lab 8, feedback that has been provided in Labs 6 and 7 should be incorporated into Lab 8 or 3 points will be deducted for each item that has not been corrected.

**Students who do not complete at least 5 out of the 7 pre-labs and 7 of the 9 laboratory reports may not pass the class.**

### **Extra-Credit Options:**

- **Book Report (Optional; 15 Extra Credit points)**

Each student can turn in a book report. Both literary and scientific content will be evaluated. The book report should be about 750 words (more than 700 and less than 800) describing the book and its relation to the course. The book report will be on an appropriate book, such as 1) [\*Weather Makers\*](#), 2) [\*When Smoke Ran Like Water\*](#), 3) [\*Firecracker Boys\*](#), etc. (note: all of these books are available at the UAF Library.) A fourth book worthy of a read is [The End of Ice: Bearing Witness and Finding Meaning in the Path of Climate Change](#) by Dahr Jamail. If you exercise this option, the book report is due the last week of class.

- **Permafrost – When Frozen Carbon Thaws (Optional; 10 Extra Credit points)**

Read the NPR article and write a 1-page (double-spaced) summary that addresses one of the topic paragraphs from the article that expresses your perspective. Provide at least one reference that supports your stance.

### **Instructor Responsibilities**

Electronic mail is usually the best method of communicating for all. When contacting me by email, include: Chem 100X and the subject (e.g., Lab 1) in the subject line. Inquiries from students will be acknowledged promptly—usually in less than 24 hours. If you have not received a response within 2 working days (48 hours) you may contact the Chemistry Department for assistance. Assignments and tests will be graded and returned with any feedback within one week after the due date. Pre-labs that require feedback will be graded on Fridays (late afternoon); please make sure to submit the Pre-labs by their respective due dates. Office hours are a time when I will be available by the contact methods listed at the top of this syllabus.

### **Checking Grades**

To check your grades and find comments from your instructor, click on the My Grades link in the sidebar menu. To see details of your grades, click on the green check mark or the underlined score in the grade column. If the score is for a test or quiz, you will see a View Attempt page where you can click on the check mark or your score to see results and feedback. If the score is for an assignment, this will take you to a Review Submission History page where you will see all your work turned in and graded to that point.

## **Pacing Expectations**

### **Assignments / Evaluation of Student Work and Progress**

Students are expected to complete the weekly assignments by their due dates. If circumstances arise that cause you to need extra time on any assignment(s), please contact me (clwhittle@alaska.edu) to make arrangements. Extensions of due dates may be granted, but must be planned in advance. (Emergency situations will be dealt with as needed.) Students are expected to maintain a working backup plan to be implemented in the event of a computer malfunction or an interruption of their normal Internet service during the course. **Late work will be accepted if submitted within 24 hours of the due date and 50% of potential points will be deducted unless an extension is granted ahead of time.** Late work submitted after the 24-hour grace period will not be graded and result in zero points earned unless an extension is granted ahead of time.

### **No Basis (NB) and Instructor Withdrawal (W)**

As described on above, students not satisfactorily active in the first part of the term will be dropped or withdrawn from the class, so justification for a No Basis grade is very unlikely. In case of extenuating circumstances later in the term, an Incomplete may be negotiated.

### **Incomplete (I)**

The grade “I” (Incomplete) is a temporary grade used to indicate that the student has satisfactorily completed (C or better) the majority of work in a course but for personal reasons beyond the student’s control, such as sickness, s/he not been able to complete the course during the regular semester. As according to UAF grading policy, negligence or indifference are not acceptable reasons for an “I” grade.

<b>First day of instruction/late registration begins</b>	<b>Mon Jan 13</b>
<b>Deadline for 100 percent refund of tuition and fees</b>	<b>Friday Jan 24</b>
<b>Deadline for student-initiated and faculty-initiated drops (course does not appear on academic record)</b>	<b>Friday Jan 24</b>
<b>Students’ Progress Reports due</b>	<b>Mon Mar 7</b>
<b>Deadline for student-initiated and faculty-initiated withdrawals (“W” grade appears on academic transcript)</b>	<b>Friday Mar 28</b>
<b>Deadline for faculty to post grades</b>	<b>Wed May 7</b>



**COVID-19 Statement:** Students should keep up-to-date on the university's policies, practices, and mandates related to COVID-19 by regularly checking this website:

<https://sites.google.com/alaska.edu/coronavirus/uaf?authuser=0>

Further, students are expected to adhere to the university's policies, practices, and mandates and are subject to disciplinary actions if they do not comply.

## **Technical Help Resources**

### **UAF Help Desk**

Go to <http://www.alaska.edu/oit/> to see about current network outages and technology news.

For technical questions, contact the Help Desk at:

- e-mail at [helpdesk@alaska.edu](mailto:helpdesk@alaska.edu)
- phone: 450-8300 (in the Fairbanks area) or 1-800-478-8226 (outside of Fairbanks)

## **Student Protections and Services Statement**

**Student protections statement:** UAF embraces and grows a culture of respect, diversity, inclusion, and caring. Students at this university are protected against sexual harassment and discrimination (Title IX). Faculty members are designated as responsible employees which means they are required to report sexual misconduct. Graduate teaching assistants do not share the same reporting obligations. For more information on your rights as a student and the resources available to you to resolve problems, please go to the following site:

<https://catalog.uaf.edu/academics-regulations/students-rights-responsibilities/>.

**Disability services statement:** I will work with the Office of Disability Services to provide reasonable accommodation to students with disabilities.

## **Student Academic Support:**

- Speaking Center (907-474-5470, [uaf-speakingcenter@alaska.edu](mailto:uaf-speakingcenter@alaska.edu), Gruening 507)
- Writing Center (907-474-5314, [uaf-writing-center@alaska.edu](mailto:uaf-writing-center@alaska.edu), Gruening 8th floor)
- UAF Math Services, [uafmathstatlab@gmail.com](mailto:uafmathstatlab@gmail.com), Chapman Building (for math fee paying students only)
- Developmental Math Lab, Gruening 406
- The Debbie Moses Learning Center at CTC (907-455-2860, 604 Barnette St, Room 120, <https://www.ctc.uaf.edu/student-services/student-success-center/>)
- For more information and resources, please see the Academic Advising Resource List ([https://www.uaf.edu/advising/lr/SKM\\_364e19011717281.pdf](https://www.uaf.edu/advising/lr/SKM_364e19011717281.pdf))

## Student Resources:

- Disability Services (907-474-5655, [uaf-disability-services@alaska.edu](mailto:uaf-disability-services@alaska.edu), Whitaker 208)
- Student Health & Counseling [6 free counseling sessions] (907-474-7043, <https://www.uaf.edu/chc/appointments.php>, Whitaker 203)
- Center for Student Rights and Responsibilities (907-474-7317, [uaf-studentrights@alaska.edu](mailto:uaf-studentrights@alaska.edu), Eielson 110)
- Associated Students of the University of Alaska Fairbanks (ASUAF) or ASUAF Student Government (907-474-7355, [asuaf.office@alaska.edu](mailto:asuaf.office@alaska.edu), Wood Center 119)

**Nondiscrimination statement:** The University of Alaska is an affirmative action/equal opportunity employer and educational institution. The University of Alaska does not discriminate on the basis of race, religion, color, national origin, citizenship, age, sex, physical or mental disability, status as a protected veteran, marital status, changes in marital status, pregnancy, childbirth or related medical conditions, parenthood, sexual orientation, gender identity, political affiliation or belief, genetic information, or other legally protected status. The University's commitment to nondiscrimination, including against sex discrimination, applies to students, employees, and applicants for admission and employment. Contact information, applicable laws, and complaint procedures are included on UA's statement of nondiscrimination available at [www.alaska.edu/nondiscrimination](http://www.alaska.edu/nondiscrimination). For more information, contact:

UAF Department of Equity and Compliance

1692 Tok Lane, 3rd floor, Constitution Hall, Fairbanks, AK 99775  
907-474-7300  
[uaf-deo@alaska.edu](mailto:uaf-deo@alaska.edu)

## Additional syllabi statement for courses including off-campus programs and research activities:

### University Sponsored Off-Campus Programs and Research Activities

We want you to know that:

1. UA is an AA/EO employer and educational institution and prohibits illegal discrimination against any individual: [www.alaska.edu/nondiscrimination](http://www.alaska.edu/nondiscrimination).
2. Incidents can be reported to your university's Equity and Compliance office (listed below) or online reporting portal. University of Alaska takes immediate, effective, and appropriate action to respond to reported acts of discrimination and harassment.
3. There are supportive measures available to individuals that may have experienced discrimination.
4. University of Alaska's Board of Regents' Policy & University Regulations (UA BoR P&R) 01.02.020 Nondiscrimination and 01.04 Sex and Gender-Based Discrimination Under Title IX, go to: <http://alaska.edu/bor/policy-regulations/>.
5. UA BoR P&R apply at all university owned or operated sites, university sanctioned events, clinical sites and during all academic or research related travel that are university sponsored.

For further information on your rights and resources [click here](#).

### **Academic Integrity and Plagiarism**

As described by UAF policy, scholastic dishonesty constitutes a violation of the university rules and regulations and is punishable according to the procedures outlined by UAF. Scholastic dishonesty includes, but is not limited to, cheating on an exam, plagiarism, and collusion. Cheating includes providing answers to or taking answers from another student. Plagiarism includes use of another author's words or arguments without attribution. Collusion includes unauthorized collaboration with another person in preparing written work for fulfillment of any course requirement. Scholastic dishonesty is punishable by removal from the course and a grade of "F." For more information <https://uaf.edu/student-affairs/student-resources/conduct>.

### **Department Policy on Cheating**

The Chemistry & Biochemistry Department Policy on Cheating is: "Any student caught cheating will be assigned a course grade of F. The student's academic advisor will be notified of this failing grade and the student will not be allowed to drop the course." Communication between students regarding the lab is acceptable but reports must show your own calculations and ideas.

Other than during quizzes and exams, communicating with each other about the subject matter of this class is only cheating if it is in collaboration for avoidance of work by either or both parties. There is everything right with helping and learning from each other.