TITLE: Introduction to Environmental Chemistry of the Arctic
NUMBER: CHEM 111X (on-campus CRN: TBD; Distance CRN: TBD)
CREDITS: 3
PREREQUISITES: DEVM 105 or higher placement
LECTURE: Monday, Friday 3:30-4:30 pm (Campus: REIC 138; Dist: Blackboard Collaborate)
LABORATORY: Wednesday 2:15-5:15 pm (Campus: REIC 245; Distance: lab kit)
DISTANCE: Distance: Remotely attend 2 hr synchronous lecture via Blackboard Collaborate or, if needed, watch lectures asynchronously. Lab experiments and collaboration performed asynchronously.

Instructors: **Dr. Sarah Hayes** **2.6(abo()11.2(i)-6.6(f)-6(e)10.5(r)10.6(hW[3(e)10.3**
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(Due Mondays at 12pm). Discussion posts evaluated on the basis of on time submission of all posts, pertinence of posts to question asked, and reflect scientific understanding. Discussion responses must be thoughtful, respectful, clearly relate to the original post, and move discussion forward. A total of 280 points are possible, of which 255 will be counted toward the final grade.

Labs (est. 3 hrs per week)- Twelve lab experiments will be performed during the semester, each worth 30 points. Lab reports will be exchanged between students and the instructors using Blackboard. Feedback on lab reports, the 5-question survey in blackboard, is worth 5 points each week. The remaining 25 points are based on on-time submission and completion of experiments. Laboratory reports are evaluated for correct prelab questions (5 pts), all measurements are recorded (10 pts), reasonable based on the experiment performed, which make it obvious the experiment was performed correctly (10 points), and thoughtful addressing of post-lab questions (5 pts).

Exams- Two hourly exams are scheduled, a midterm and final exam. Exam questions probe conceptual level understanding and student synthesis of material presented in the course. The questions are typically essay format questions and are open note, book, internet, and mind. The only resource not allowed is other students. Requirements of student responses are clearly articulated within each exam question. Questions probe scientific understanding of course material and the relationship of that material to other course content as well as to the overall environmental health of the arctic.

Final Presentation- Final presentations on surface water characterized during the semester will be performed during the final exam period. Presentations are evaluated on the basis of the information conveyed about the water quality at their site, development of professional slides, and delivery of an interesting, concise presentation.

Successful, timely completion of this course depends on committing y6.64 ET w 0 -1.13 TD [(S)2(uccessf

RESPONSE TIME

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3. **ASSIGNMENTS:** readings, *case studies, quizzes, homework 22%*
4. **COLLABORATION:** *case studies, laboratory project 23%*

*This metric of student effort is used during development to ensure rigor and alignment with the federal guidelines and definitions for credit hour equivalents for online learning and other out-of-classroom work. This portion of the syllabus is for development purposes only and students will see only the sections required by Faculty Senate in their syllabus.

EXPECTATION OF STUDENT EFFORT

Students should expect to spend 9 hours per week on this class. 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), e-mail your instructor for guidance. Extensions of due dates may be granted, but your instructor expects to be informed in advance if you are not able to submit your assignment on time. 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.

ACADEMIC INTEGRITY

Honor code and Academic integrity- Students are expected to conduct themselves in accordance with the UAF Honor code. The Chemistry Department policy states: *Any student caught cheating will be*

If you believe you are eligible, please visit their web site (http://www.uaf.edu/disability/) or contact a

Tentative Lecture and Lab Schedule

Week 1 – Introduction

Reading: Environmental Science, Ch 1-2

Case study: The Obligation to Endure, an excerpt from Silent Spring by Rachel Carson

Lab 1: Safety and Scientific Method

- Safety map and contract
- Data interpretation and testable observations
- Neutralization of acids and bases

Week 2 – Air Quality

Reading: Environmental Science, Ch 3, 25

Case study: Bear Trouble

Lab 2: Modeling Air Quality and Introduction to pH

HYSPLIT modeling of air plumes
PHET simulation- pH scale basics
pH of household items

Week 3: Introduction to Water Quality

Reading: Environmental Science, Ch 17

Case study: Tricolsan in water treatment – from research to regulation in Minnesota

Lab 3: Water Quality and Contamination

Effects of water contamination
Water treatment
Practice with environmental probe measurements

Week 4: Water Quality and Treatment

Reading: Environmental Science, Ch 18

Case study: Interview with CH2M Hill professionals

Lab 4: Sampling Surface Water- Distance

Selecting a sample site
Sampling natural waters
Sample preservation
Distance students: Prepare and ship samples to UAF for additional analysis.
On campus students: Jigsaw of analytical techniques.

Week 5 – Water Qualit3 2.6( )3en5

Reading: Environmental Monitoring and Characterization, Ch 16 *Available on blackboard*
Case study: PCBs in salmon causing accumulation in spawning lake sediments
Lab 7: Contaminant Partitioning
Contaminant partitioning in the environment

Week 8– Weathering and Soil Formation
Reading: Environmental Science, Ch 19, 23
Case study- How permanent is permafrost?
Lab 8: Weathering and Soil Formation
Rocks into soil
Exploring Alaskan soils

Week 9 – Metals and Inorganic Contaminants
Reading: Environmental Science, Ch 24
Case study – Pebble mine: Tension between mineral recovery, fishing, and community health
Lab 9: Soil Quality and Contamination
x Soil contamination
x Treating acid mine drainage

Week 10 – Environmental Microbiology I
Reading: Environmental Science, Ch 6, Environmental Monitoring and Characterization, Ch 14
Case study: Coliforms in Antarctica
Lab 10: Microbiology of Soils
x Virtual microscope
x Virtual pond dip

Week 11 – Environmental Microbiology II
Reading: Environmental Science, Ch 7
Case study – Oil Biodegradation and Bioremediation: A Tale of the Two Worst Spills in US History
Lab 11: Biodiversity and Biomagnification
Yeast responses to pollution
Biomagnification

Week 12 – Ecological Interactions and Bioaccumulation
Reading: Environmental Science, Ch 9
Case study: Bioaccumulation in the Arctic
Lab 12: no lab, Thanksgiving

Week 13 –Forest Fires & Ecological Succession
Reading: Environmental Science, Ch 26
Case study: Primary succession following deglaciation at Glacier Bay, Alaska
Lab 13: Sharing project data. Peer research project presentations, peer evaluations

Week 14 - Climate Change in the Arctic
Reading: Environmental Science, Ch 28
Case study: What does the data tell us about climate change?
Lab 14: Energy Sources and Climate Change
Energy sources and alternative energy
Climate change

Week 15 – Peer Research Presentations, Story GIS Project