CIV E 620 Environmental Engineering Measurements I

Fall 2025 - September 02 to December 08

Class time: Tuesday, Thursday 12:30-13:50 Location: NRE 2-122

Instructor:

Chelsea Benally, PhD, she,her

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DICE 7-215
Office Hours: TBD, or by appointment

Course Description:

*4.5 (fi) (either term, 3-0-3) Theory and procedures for determining the quality of natural water, potable water, municipal and industrial wastes. Fundamental parameters and concepts for environmental quality evaluation

Course synchronous and asynchronous content delivery schedule:

Lectures: A combination of in-person synchronous sessions and online asynchronous content.
Labs: All labs will be in-person and synchronous.
Exams: Both the midterm and final exams will be in-person and synchronous.

Land Acknowledgment:

The University of Alberta respectfully acknowledges that we are located on Treaty 6 territory, a traditional gathering place for diverse Indigenous peoples including the Cree, Blackfoot, Métis, Nakota Sioux, Iroquois, Dene, Ojibway/ Saulteaux/Anishinaabe, Inuit, and many others whose histories, languages, and cultures continue to influence our vibrant community.

TA Information:

TBD

Lab Sections:

Section	Day	Time	Location
D51	Friday	09:00-11:50	NREF 2-010

Course Objectives & General Content:

Course Objectives:

- Introduce the theory and procedures for determining the quality of natural water, potable water, municipal and industrial wastes.
- Introduce the fundamental parameters and concepts for environmental quality evaluation.

- Perform basic experimental analyses for evaluating key parameters in water analysis.

Topics (time permitting)

- Basic concepts
- Chemical kinetics
- Chemical equilibrium
- Acid/Base chemistry
- Oxidation/Reduction
- Coordination/Complexation
- Precipitation/Dissolution
- Organic Chemistry
- Carbonate System, Alkalinity, Buffers

Learning Outcomes:

By the end of this course, students should be able to:

1. Demonstrate knowledge of chemical principles and processes of various fundamental environmental phenomena and processes.
2. Apply basic chemical concepts to analyze chemical processes involved in different environmental problems.
3. Perform common environmental experiments relating to water and wastewater quality, and know which tests are appropriate for given environmental problems.
4. Demonstrate the ability to write clear technical laboratory reports.

Marking Scheme:

Activity	(A)Synchronous	Due/Scheduled	Weight
Final Exam	Synchronous	Thursday, December 18, 2025	40%
Midterm Exam	Synchronous	Thursday, October 16, 2025	20%
Lab portion (reports, project, lab final)	Synchronous	refer to lab schedule	30%
In-class activities and assignments	Asynchronous		10%

The Faculty recommended grade point average for a 600 level course is 3.3.Instructors have the leeway to deviate from this average and can assign grades based on their own scheme. All grades are approved by the department chair (or delegate). The office of the Dean has final oversight on all grades.

Term Work

All term work solutions will be posted no later than the last day of classes. All term work will be returned to students by the final day of classes, with the exception of major term work due in the last week of classes.

The latter will be returned by the day of the final examination or the last day of the examination period if there is no final examination in the course as per university policy; instructors will make accommodations to return these term work. It is the responsibility of the student to pick up all their term work at the specified time and place. Any unreturned term work, shall be retained and then shredded six months after the deadline for reappraisal and grade appeals. Final examinations will be kept for one year as required by university guidelines and the Government of Alberta's Freedom of Information and Protection of Privacy Act.

Additional Notes

If you miss the midterm exam because you are ill, the percentage for the midterm exam will be placed on the final exam.

Calculator Policy

Only approved non-programmable calculators are permitted in examinations. Any calculator taken into an examination must have a sticker identifying it as an acceptable non-programmable calculator (gold sticker). Students can purchase calculators at the University Bookstore with the stickers already affixed. Calculators purchased elsewhere can be brought to the Student Services where the appropriate sticker will be affixed to the calculator.

Expectations for AI use

In this course, we commit to AI use guided by ethical and transparent principles. While students are allowed to use advanced automated tools (such as ChatGPT or Dall-E 2) for certain written assignments, it is crucial to adhere to the following guidelines:
Seek prior approval from the instructor for AI use in specific assignments.
When allowed, clearly attribute and cite any AI-generated content in your work, including prompts and AI outputs as part of your academic record. Include an additional reflection component in your assessments, discussing how AI tools contributed to your learning process.
IMPORTANT: Please note that AI use is strictly prohibited in assessments and assignments not approved by the instructor. Failure to abide by this guideline may be considered an act of cheating and a violation as outlined in the relevant sections of University of Alberta (November 2022) Code of Student Behaviour .

Text and References (Recommended):

Material will be taken from:
Sawyer, C.N., McCarty, P.L., Parkin, G.F. 2003. Chemistry for Environmental Engineering and Science, fifth edition, McGraw-Hill Inc., New York, NY, 752 p.

Refer to Canvas for any additional references

Website:

University LMS - Canvas

Previous Examples of Evaluative Materials:

The new LMS (Canvas) will be used to provide students with the framework of lecture notes, suggested problems, solutions for the problems, sample midterm questions, sample final exam questions, class and lab announcements, and additional material (reading material, useful websites, etc.).

Lab Information:

Lab Topic	Date
Lab 1: Introductory Lab - Part 1: Safety	2025-09-12
Lab 2: Introductory Lab - Part 2: Instrumentation	2025-09-19
Lab 3: Gravimetric Analysis (Lab order subject to change)	2025-09-26
Lab 4: TOC/COD/DO (lab order subject to change)	2025-10-03
Lab 5: Hardness (lab order subject to change)	2025-10-17
Lab 6: Phosphate analysis (lab order subject to change)	2025-10-24
Lab 7: Analytical Instrumentation used in Envr. Analyses: project presentations + handouts	2025-11-21
Lab 8: Laboratory Final Exam	2025-11-28

Students will undergo WHMIS and lab specific safety training as a part of this course and are expected to follow appropriate lab safety procedures at all times.

Did you know that the University of Alberta has various low-to-no-cost services to help students succeed? Visit http://www.deanofstudents.ualberta.ca/ for information about the academic, wellness, and various other support services available to U of A students. It's never too early or too late to seek help!

Fall 2025 CIV E 620 – Tentative schedule of exams, lectures, labs, some deadlines (lab)

Date	Lecture or Lab	Details
2025-Sept-02	Lecture 1	Syllabus & Topic 1: Front matter/basic concepts
2025-Sept-04	Lecture 2	Topic 1
2025-Sept-9	Lecture 3	Topic 1
2025-Sept-11	Lecture 4	Topic 2: Kinetics
2025-Sept-12	**Lab 1**	**Intro Part 1- Safety**
2025-Sept-16	Lecture 5	Topic 2
2025-Sept-18	Lecture 6	Topic 2
2025-Sept-19	**Lab 2**	**Intro Part 2 - Instrumentation**
2025-Sept-23	Lecture 7	Topic 2
2025-Sept-25	Lecture 8	Topic 3: Chemical equil/thermo and partitioning
2025-Sept-26	**Lab 3**	**Gravimetric Analysis***
2025-Oct-2	Lecture 9	Topic 3
2025-Oct-3	**Lab 4**	**TOC/COD/DO***
2025-Oct-3	**Report deadline**	***Lab 3 report due***
2025-Oct-7	Lecture 10	Topic 3
2025-Oct-9	Lecture 11	Topic 3
2025-Oct-10	**Report deadline**	***Lab 4 report due***
2025-Oct-14	Lecture 12	Midterm review
2025-Oct-16	**Lecture 13**	**MIDTERM EXAM**
2025-Oct-17	**Lab 5**	**Hardness***
2025-Oct-21	Lecture 14	Topic 4: Acid/Base Chemistry & Midterm Review
2025-Oct-23	Lecture 15	Topic 4
2025-Oct-24	**Lab 6**	**Phosphate analysis***
2025-Oct-24	**Report deadline**	***Lab 5 report due***
2025-Oct-28	Lecture 16	Topic 4
2025-Oct-30	Lecture 17	Topic 4
2025-Oct-31	**Report deadline**	***Lab 6 report due***
2025-Nov-4	Lecture 18	Topic 5: Oxidation/Reduction Rxns
2025-Nov-6	Lecture 19	Topic 5
2025-Nov-7	**Lab (optional)**	**Optional working time for projects**
2025-Nov-18	Lecture 20	Topic 5
2025-Nov-20	Lecture 21	Topic 5
2025-Nov-21	**Lab 7**	***Analytical Instrumentation used in Environmental Analysis: In-class project presentations and handouts due***
2025-Nov-25	Lecture 22	Topic 6: Complexation & Precipitation/Dissolution
2025-Nov-27	Lecture 23	Topic 6
2025-Nov-28	**LAB 8**	**LAB FINAL EXAM**
2025-Dec-2	Lecture 24	Topic 6
2025-Dec-4	Lecture 25	Final REVIEW
2025-Dec-18	**EXAM**	**FINAL EXAM according to the UA final exam scheduler**

* The order of the labs may change, but the number of labs will remain the same

Note: ***This schedule may change according to the course instructor***. In-class work or assignments linked to the lectures are not shown.

University and faculty policies

Respect and professionalism

The Faculty of Engineering is committed to fostering and protecting an equitable, inclusive, and respectful work and study environment in line with University of Alberta policies and professional engineering industry standards.

The faculty prepares students to uphold industry standards to become a Professional Engineer (P.Eng). Therefore, respect, professionalism, and accountability must be upheld within the Faculty of Engineering and the University of Alberta.

Academic integrity and student conduct

The University of Alberta is committed to the highest standards of academic integrity and honesty, as well as maintaining a learning environment that fosters the safety, security, and the inherent dignity of each member of the community, ensuring students conduct themselves accordingly. Students are expected to be familiar with the standards of academic honesty and appropriate student conduct, and to uphold the policies of the University in this respect.

Students are particularly urged to familiarize themselves with the provisions of the Student Academic Integrity Policy and the Student Conduct Policy, and avoid any behaviour that could

potentially result in suspicions of academic misconduct (e.g., cheating, plagiarism, misrepresentation of facts, participation in an offence) and non-academic misconduct (e.g., discrimination, harassment, physical assault). Academic and non-academic misconduct are taken very seriously and can result in suspension or expulsion from the University.

All students are expected to consult the Academic Integrity website for clarification on the various academic offences. All forms of academic dishonesty are unacceptable at the University. Unfamiliarity of the rules, procrastination or personal pressures are not acceptable excuses for committing an offence. Listen to your instructor, be a good person, ask for help when you need it, and do your own work -- this will lead you toward a path to success. Any academic integrity concern in this course will be reported to the College of Natural and Applied Sciences. Suspected cases of non-academic misconduct will be reported to the Dean of Students. The College, the Faculty, and the Dean of Students are committed to student rights and responsibilities, and adhere to due process and administrative fairness, as outlined in the Student Academic Integrity Policy and the Student Conduct Policy. Please refer to the policy websites for details on inappropriate behaviours and possible sanctions.

The College of Natural and Applied Sciences (CNAS) has created an Academic Integrity for CNAS Students eClass site. Students can self-enroll and review the various resources provided, including the importance of academic integrity, examples of academic misconduct & possible sanctions, and the academic misconduct & appeal process. Students can also complete assessments to test their knowledge and earn a completion certificate.

"Integrity is doing the right thing, even when no one is watching." -- C.S. Lewis

The Faculty of Engineering expects an environment free of harassment, discrimination, and bullying. We encourage you to talk to the Office of Safe Disclosure and Human Rights about experiences, questions, or concerns. Additional resources and support for students are attached below.

Engineering students studying in the province of Alberta must also follow the Code of Ethics set by the Association of Professional Engineers and Geoscientists of Alberta (APEGA).

Course outline policies, course requirements, evaluation and grading information can be found in the University Calendar.

Safety during learning activities

In all Faculty of Engineering courses, labs, seminars or other learning activities, safety is of paramount importance. In some cases, laboratory work in a program requires high standards for risk management to keep potential hazards safely under control.

Anyone found to be unable to function safely in the class, lab, seminar or other learning activity may be asked to leave or be removed for their and the safety of other participants and instructors in alignment with the Student Academic Integrity Policy and Student Conduct Policy. As members, or prospective members, of the engineering profession, it is your responsibility to identify and inform the proper authorities of unsafe work.

Audio and video recording

Audio or video recording, digital or otherwise, of lectures, labs, seminars or any other teaching environment by students is allowed only with the prior written consent of the instructor or as a part of an approved accommodation plan.

Student or instructor content, digital or otherwise, created and/or used within the context of the course is to be used solely for personal study and is not to be used or distributed for any other purpose without prior written consent from the content author(s).

Only those items specifically authorized by the instructor may be brought into the exam facility. Students must not bring any unauthorized electronic device into an examination room, including cell phones or other devices.

Student services and support

Health & Wellness Support

Counselling and Clinical Services

Free, short-term, appointment-based counselling and psychiatric services. Also offers drop-in workshops. Book an initial consultation. Visit uab.ca/CCS to learn more.

Wellness Supports Social Workers

Free one-on-one support for students in the areas of housing, finances, academics, personal wellness, life skill development, family dynamics, system navigation, and any area of life where there is a desire to invite change. Visit uab.ca/wellness to learn more.

Sexual Assault Centre

Free, anonymous, and confidential drop-in counselling. Visit uab.ca/UASAC to learn more.

The Office of Safe Disclosure & Human Rights (OSDHR)

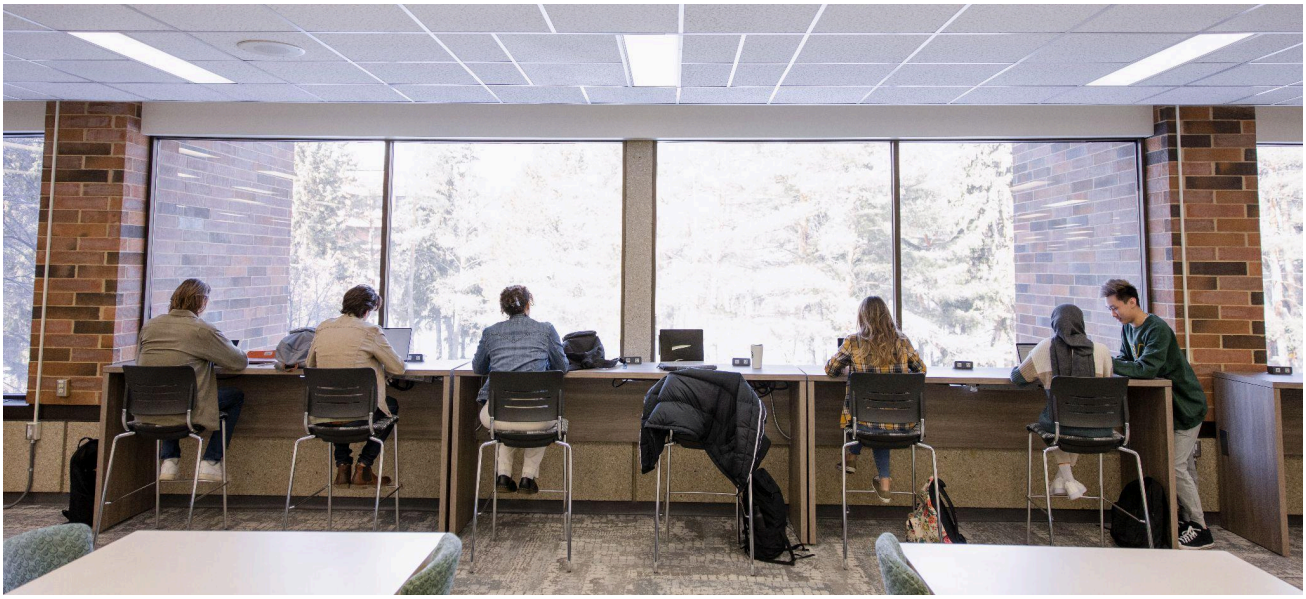
The OSDHR advises confidentially on sensitive issues you may not feel comfortable solving on your own. Contact the OSDHR if you want to get help or to make a report while keeping your privacy. Visit uab.ca/OSDHR to learn more.

HIAR (Helping Individuals at Risk)

If you're worried about someone, contact HIAR, who can help assess risk and connect individuals to support. Learn more at uab.ca/HIAR.

Immediate External Supports

Health Link Alberta: 811
Suicide Crisis Helpline: 988



Academic support

Academic Success Centre
Access to a variety of services to maximize your academic success. Learn more at uab.ca/ASC.

Accessibility Resources
Connects students with disabilities to accommodations. Learn more at uab.ca/Access under accommodations + accessibility.

Decima Robinson Support Centre
Academic support for 100- or 200-level introductory calculus, linear algebra and statistics courses. Visit uab.ca/DSC to learn more.

Engineering Student Success Centre
The Faculty of Engineering provides drop-in tutoring for first-year courses. Visit uab.ca/ESSC to learn more.

Office of the Student Ombuds
Call for complex problems and conflict mediation. Learn more at uab.ca/ombuds.

Financial support

Student Service Centre

For awards and other funding support. Learn more at uab.ca/ask.

Campus Food Bank

The Campus Food Bank Society is an independent charity supporting University of Alberta students, faculty, staff, and alumni for up to five years. For additional information visit their website at campusfoodbank.com.

Additional Information Related to the Laboratory

Grading for the lab portion of the course

Lab reports/pres.	75% (4 lab reports and 1 presentation/handout)
Lab final	20% (during the lab period on Nov. 28, 2025)
Lab notebook	5% (to be handed in with Lab 6 report)
TOTAL	100% (30% of the overall course grade)

Laboratory Policies

- Teams of up to four students each will prepare and submit a report for Lab 3, 4, 5 and 6.
- Teams of up to four students each will work together on the lab project with 1 deliverable and a presentation (details provided later in the semester)
- Teams will be specified by the lab instructor and may change for each lab. Reports must be submitted by the teams specified by the instructor.
- Laboratory reports are to be submitted electronically by 11:59 pm on the specified day (see lab schedule). Late reports will be penalized by 15% per day.
- It is required that each student attends the lab and contributes equally to the preparation of the lab report. Should you have any conflicts (e.g., conferences, etc.) please inform your course instructor ahead of time. If you are ill, please let the course and lab instructor know as soon as possible. It's not possible to make-up the laboratory portion since there is only lab section for this course. For any approved absence, the student may work with their assigned lab group and contribute to the preparation of the lab report.

Laboratory Safety

You will be working with and near dangerous chemicals and bio-hazards. **Safety glasses and gloves will be provided and must be worn**. **Lab coats are mandatory**. **Do not wear contact lenses to the lab, wear glasses if you need to**. **Food or drinks are not allowed in the lab**. **Open toed shoes or sandals are not permitted in the lab**.

Maintaining a Laboratory Notebook

Effective record keeping is crucial for maintaining professionalism in laboratory practice and research. Despite the prevalence of computers in modern times, the laboratory notebook remains the primary tool for documenting information. It can serve as a legal document that can be used in legal proceedings

if necessary. To instill the importance of meticulous record-keeping, students are required to maintain their own laboratory notebooks. Each student is expected to acquire a hardcover lab notebook for the purpose of recording all data and notes gathered during lab experiments.

- Even though labs will be performed in groups, **each student must record all measurements** required for each lab exercise.
- **Use a pen** to record data and notes, and do not erase erroneous entries, put a line though them
- The lab notebook must have a table of contents in the first few pages and each page should be numbered and dated. *It is recommended to set this up prior to the start of the lab exercises.*
- For each lab, include the lab title, a brief description of the lab objective(s) and a summary of the key steps involved (this can be in the form of a flowchart). *It is recommended to prepare this prior to the start of each lab.*
- Prepare any tables required for data collection before the lab. *It is recommended to complete this step prior to the start of each lab.*
- Record all measurements made in the lab. Also record relevant or unusual observations (i.e. the solution turned blue, the reactants started to burn furiously).
- At the end of each lab, each student must have their lab notebooks checked and signed by the lab technician, the TA, or the lab instructor.
- A grade will be assigned to the lab notebook at the end of the course. Keep in mind that lab notebooks are **INDIVIDUAL SUBMISSIONS**.

Requirements for Lab Reports

The lab reports should be written using concise, technical, and correct English, on a word processor. Lab reports should be double-spaced, 12 pt. font, 1 inch margins on all borders and contain the sections in the rubric (below). There is no minimum or maximum length for the lab reports, but a typical report should be about 5 pages (not including the cover page or appendices), which will largely depend on the number of graphs and tables you choose to include within the report. Quality should be emphasized over quantity. A good report is complete yet also concise.

The following marking rubric will be used by the teaching assistant to mark the lab reports:

Element		Highest Mark
Cover Page	Include the course title and number, title of the lab, all group members' names, student ID numbers, and the date on which the report was completed	2
Abstract	Summarize the objectives, main results, and main conclusions of the report. The abstract should be brief (about 2 paragraphs, not exceeding 1 page). Some journals specify that an abstract should be no more than 250 words.	2
1.0 Introduction & Theory	Provide a brief description of what the report addresses, including the objectives of the experiment and the report. Provide the key principles or equations that relate to the report.	6
2.0 Materials and Methods	Summarize the materials and methods used, including pertinent safety procedures. Indicate any changes to the procedure described in the lab handout (if applicable) and describe the samples analyzed. To avoid duplication, you may refer the reader to the appendix (Appendix A) for the full procedure and include your lab handout in Appendix A.	3
3.0 Results	Clearly present the final results (i.e. reduced data) in tabulated and/or graphical form (as appropriate). Each table or figure should be introduced within the report with one or two sentences (e.g. "Table 1 shows the results of the Total Coliform test performed on a sample of water collected from Lesser Slave Lake"). All tables and figures should be captioned. Table captions should be centered above the table, while figure captions should be centered below the figure. Raw data and sample calculations should be found in the appendix (Appendix B and Appendix C, respectively), and referred to in the report.	5
4.0 Discussion	Clearly provide a description of the results; an explanation of their significance; a comparison of the results with typical or expected values (if appropriate); a discussion of the sources of errors which occurred during the performance of the experiment; etc. Include answers to the "Discussion Questions" in the lab handout. **Note: this is the most important section of the lab report.**	8
5.0 Conclusions	Summarize the results of the test or experiment. The findings should reflect the objectives in the introduction. This section should not contain any new information or discussion.	3
References	List citations referred to in the body of the report	3
Appendices	Use a separate appendix for each of the following: Lab handout, raw data, sample calculations, etc. Appendices should be referred to in the main body of the report.	2
Overall Quality	Used proper spelling, grammar, technical English, included in-text citations, appropriate sections headings and captions for all tables and figures (table captions are placed above tables; figure captions go below the figure), etc.	6
Peer Evaluation	Average of the score given by your team which will be submitted confidentially for each report	5
TOTAL		45

Lab Schedule – ***may change at the discretion of the course instructor***

Lab	Date lab performed	Date lab report due	Textbook reference***	Standard Methods
Lab 1: Introductory Lab Part 1 Safety	Sept. 12, 2025	No lab report*	Chap. 9, 10.1-10.3	N/A
Lab 2: Introductory Lab Part 2 Instrumentation	Sept. 19, 2025	No lab report		N/A
Lab 3: Gravimetric Analysis	Sept. 26, 2025	Oct. 3, 2025	Chap. 26	2540
Lab 4: TOC/COD/DO	Oct. 3, 2025	Oct. 10, 2025	Chap. 12, 22, 24	4500-O, 5220, 5310
Lab 5: Hardness	Oct. 17, 2025	Oct. 24, 2025	Chap. 19	2340
Lab 6: Phosphate Analysis	Oct. 24, 2025	Oct. 31, 2025	Chap. 30	4500-P
Lab 7: Analytical Instrumentation used in Environmental Analysis	Nov. 6/7, 2025 Project out	Nov. 21, 2025 In-class presentation & handout due**	Chap. 22, 24	
Lab 8: Lab Final	Nov. 28, 2025	None		

** There is no report for this lab. You must complete the diagrams in your notebook, answer the questions, and submit WHMIS certificate before LAB 2*

*** More information regarding the expectations for the presentation and handout will be provided separately.*

****From Sawyer et al. text – refer to syllabus recommended texts*