

Environmental Technology

Winter 2022

ENVT 163A: WATER QUALITY

3 credits, 2 hours lecture per week, 3 hours laboratory per week

This course provides an overview of water quality protection and pollution control of ground and surface water. Treatment of drinking water and municipal wastewater, water quality guidelines for drinking water and surface water, pathogens, oxygen levels and nutrient loading, properties of water, related chemistry and terminology, ecology of lentic systems, turnover, thermal stratification, and hydrology of the northern river basin are discussed.

Prerequisites: CHEM 101 and EAS 100

Instructor:

Dr. Blaine Legaree

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Office Hours

Mon/Wed/Fridays 3:00–4:00 pm

Wed/Fridays 9:30–10:30 am

Hours of Instruction

Lecture: Mon/Wednesdays 1:00 – 1:50 pm Rm S210

Laboratory: Thursdays 9:00-11:50 am Rm S114, CC236 or Computer lab

Required Resources

1. **ENVT 163 Laboratory Manual**. Winter 2022 Edition. Keyano College.
2. **Laboratory coat**.
3. **Laboratory goggles**.
4. **Waterproof marker**. Finetip marker (e.g. Sharpie) for labelling test tubes, etc.
5. **Moodle** (<http://ilearn.keyano.ca>). The course outline, lecture notes and other resources will be made available on Moodle.

Course Outcomes

Upon successful completion of this course, the student will be able to:

- Demonstrate an understanding of water chemistry, biology and fluid dynamics through laboratory and field exercises, assignments, and tests.
- Discuss processes used in drinking water and wastewater treatment.
- Examine environmental issues related to water quality protection and pollution control.
- Discuss the challenges of water treatment and processing faced by industry and society.
- Create scientific lab reports that discuss and analyze laboratory data.
- Discuss basic air quality concepts such as greenhouse gases and other major pollutants.

Evaluation

Tests (4)	40%	Test dates TBA
Laboratory	35%	<i>Evaluation detailed in the laboratory manual.</i>
Final Examination	25%	<i>Date to be set by the Registrar</i>

A grade of C- is required for progression or transfer.

Tests and Examinations

Test dates will be determined by class progress and will be approximately every 2-3 weeks.

Tests and exams will include both multiple choice questions and written answer questions and will be based on material covered in lectures and labs.

The final lecture examination is cumulative and **must** be written in order to complete this course.

Laboratory

The laboratory component is detailed in the course laboratory manual and includes written assignments and reports.

Students are expected to attend all labs and complete all lab assignments in order receive a passing grade.

Late assignments will be penalized 10% per day late and will not be accepted if more than 5 days late.

Grading System

Descriptor	Alpha Grade	4.0 Scale	Percent	Rubric for Letter Grades
Excellent	A+	4.0	> 92.9	Work shows in-depth and critical analysis, well developed ideas, creativity, excellent writing, clarity and proper format.
	A	4.0	85 – 92.9	
	A-	3.7	80 – 84.9	
Good	B+	3.3	77 – 79.9	Work is generally of high quality, well developed, well written, has clarity, and uses proper format.
	B	3.0	74 – 76.9	
	B-	2.7	70 – 73.9	
Satisfactory Progression	C+	2.3	67 – 69.9	Work has some developed ideas but needs more attention to clarity, style and formatting.
	C	2.0	64 – 66.9	
	C-	1.7	60 – 63.9	
Poor	D+	1.3	55 – 59.9	Work is completed in a general way with minimal support, or is poorly written or did not use proper format.
Minimum Pass	D	1.0	50 – 54.9	
Failure	F	0.0	< 50	Responses fail to demonstrate appropriate understanding or are fundamentally incomplete.

Schedule of Topics

Lecture Topic	Readings and References**
1. Water Properties	U.S. Geological Survey (USGS): https://www.usgs.gov/special-topic/water-science-school/science/water-properties <i>Fundamental Characteristics of Water</i> by Peter Chung Chieh: https://learnclax.com/schooltextbooks/schooltextbooks.php?bookid=1468&Fundamental-Characteristics-of-Water-PDF-by-Chung-Chieh
2. Hydrology & Water Resources	Facts about Water in Alberta: https://open.alberta.ca/publications/9780778589709 Natural Resources Canada Water Distribution: https://www.nrcan.gc.ca/earth-sciences/geography/atlas-canada/selected-thematic-maps/16888 U.S. Geological Survey's (USGS) Water Resources Page: https://www.usgs.gov/special-topic/water-science-school
3. Water Chemistry	Water quality units of measurement and parameters: http://edis.ifas.ufl.edu/pdffiles/CH/CH17600.pdf http://www.philadelphia.edu.jo/academics/myounes/uploads/course%20materials/Environmental%20Eng/IV.pdf Milliequivalents are detailed in the notes and also here: https://sciencing.com/calculate-milliequivalent-5009675.html Water Hardness: https://www.sunrisespecialty.com/how-to-calculate-water-hardness Alkalinity calculations: https://sciencing.com/calculate-alkalinity-caco-5328969.html http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/drinkingwaterlbs/AlkalinityConversions.pdf Dissolved Oxygen: https://www.fondriest.com/environmental-measurements/parameters/water-quality/dissolved-oxygen/
4. Water Biology	Waterborne Diseases: http://www.phac-aspc.gc.ca/cphorsphc-respcacsp/2013/food-water_alim-eau-eng.php http://www.azdhs.gov/phs/oids/epi/waterborne/list.htm http://www.lenntech.com/library/diseases/diseases/waterborne-diseases.htm Microbiological Analyses of Water: https://www.who.int/water_sanitation_health/resourcesquality/wqmchap10.pdf Algal blooms: https://www.noaa.gov/what-is-harmful-algal-bloom https://www.albertahealthservices.ca/assets/news/advisories/ne-pha-bga-faq.pdf BOD: https://secure.caes.uga.edu/extension/publications/files/pdf/C%20992_4.PDF http://www.freedrinkingwater.com/water_quality/quality1/1-bod-effects-on-water-quality.htm
5. Laboratory and Field Sampling Methods	Spectrophotometry: http://chemwiki.ucdavis.edu/Physical_Chemistry/Kinetics/Reaction_Rates/Experimental_Determination_of_Kinetics/Spectrophotometry http://www2.chemistry.msu.edu/faculty/reusch/virttxtjml/spectrpy/uv-vis/spectrum.htm Protocols Manual for Water Quality Sampling in Canada: http://protocols.ccm.ca/ Aquatic Ecosystems Field Sampling Protocols (Alberta Environment) https://open.alberta.ca/publications/077855080x British Columbia Field Sampling Manual: https://www2.gov.bc.ca/gov/content/environment/research-monitoring-reporting/monitoring/laboratory-standards-quality-assurance/bc-field-sampling-manual
6. Hydraulics	Hydrostatic pressure: https://youtu.be/C0ujLqKPWew http://hyperphysics.phy-astr.gsu.edu/hbase/pflu.html Continuity Equation: http://www.aplusphysics.com/courses/honors/fluids/continuity.html
7. Water Use and Distribution	Water availability in Canada https://www.canada.ca/en/environment-climate-change/services/environmental-indicators/water.html https://www.iisd.org/ela/blog/commentary/three-major-threats-canadas-fresh-water-iisd-ela-overcome/ Water Use in Canada https://www150.statcan.gc.ca/n1/pub/16-201-x/16-201-x2017000-eng.htm

8. Water Pollution & Water Quality Standards	Water Pollution: https://www.nrdc.org/stories/water-pollution-everything-you-need-know Canadian Drinking Water Guidelines: https://www.canada.ca/en/health-canada/services/environmental-workplace-health/water-quality/drinking-water/canadian-drinking-water-guidelines.html Solids and Turbidity: https://www.fondriest.com/environmental-measurements/parameters/water-quality/turbidity-total-suspended-solids-water-clarity/
9. Drinking Water Processing	Suez Handbook of Industrial Water Treatment: https://www.suezwatertechnologies.com/handbook/handbook-industrial-water-treatment
10. Wastewater Characteristics & Collection	How Do Sewer Systems Work? https://youtu.be/CoFuQZBPCk0 City of Winnipeg: http://winnipeg.ca/waterandwaste/sewage/systemOperation.stm
11. Wastewater Processing	http://www.fao.org/docrep/t0551e/t0551e05.htm http://www.calgary.ca/UEP/Water/Pages/Water-and-wastewater-systems/Wastewater-system/Wastewater-treatment-tour.aspx https://guelph.ca/wp-content/uploads/IntroductionToWastewater.pdf http://www.scientificamerican.com/article/treating-sewage/
12. Air Quality	NASA Global Climate Change: https://climate.nasa.gov/ Canadian Council of Ministers of the Environment: Canada's Air: http://airquality-qualitedelair.ccme.ca/en/ Wood Buffalo Environmental Association: https://wbea.org/

***The reference and reading material for this course is gathered from a variety of sources. For a complete detailed list of suggested readings for ENVT 163, see the course lecture notes.*

Please Note – To facilitate unforeseen time constraints, time allotted to each topic is subject to change.

Laboratory Safety

Students must complete the *WHMIS for Students* online training course on Moodle before entering the science laboratories.

Students must comply with the mandatory laboratory safety rules for this course as provided in the laboratory manual. Failure to do so will result in progressive discipline such as a verbal warning, refused entry into the laboratory, or suspension from the College.

Before entering the lab, students are responsible reviewing the lab manual and relevant Safety Data Sheets for the purpose of evaluating risks associated to health. Some hazards used in the laboratory may have additional risks to those with pre-existing medical conditions.

Performance Requirements

Student Responsibilities

It is your responsibility as a student to contact the Office of the Registrar to complete the forms for Withdrawal or Change of Registration, and any other forms. Please refer to the list of important dates as noted in the Academic Schedule in the [Keyano College credit calendar](#). The Keyano College credit calendar also has information about Student Rights and Code of Conduct. It is the responsibility of each student to be aware of the guidelines outlined in the Student Rights and Code of Conduct Policies.

Student Attendance

Class attendance is useful for two reasons. First, class attendance maximizes a student's learning experience. Second, attending class is a good way to keep informed of matters relating to the administration of the course (e.g., the timing of assignments and exams). Ultimately, you are responsible for your own learning and performance in this course.

It is the responsibility of each student to be prepared for all classes. Students who miss classes are responsible for the material covered in those classes and for ensuring that they are prepared for the next class, including the completion of any assignments and / or notes that may be due.

Academic Misconduct

Students are considered to be responsible adults and should adhere to principles of intellectual integrity. Intellectual dishonesty may take many forms, such as:

- Plagiarism or the submission of another person's work as one's own
- The use of unauthorized aids in assignments or examinations (cheating)
- Collusion or the unauthorized collaboration with others in preparing work
- The deliberate misrepresentation of qualifications
- The willful distortion of results or data
- Substitution in an examination by another person
- Handing in the same unchanged work as submitted for another assignment
- Breach of confidentiality.

The consequences for academic misconduct range from a verbal reprimand to expulsion from the College. More specific descriptions and details are found in the Student Rights and Student Code of Conduct section of the Keyano College credit calendar. It is the responsibility of each student to be aware of the guidelines outlined in the Student Rights and Student Code of Conduct Policies.

In order to ensure your understanding of the concept of plagiarism, you must successfully complete the online Plagiarism Recognition Tutorial at ilearn.keyano.ca. Then print the certificate, sign it, and show it to each of your instructors. Your course work will not be graded until you show this signed certificate.

Specialized Supports

The Student Services Department is committed to Keyano students and their academic success. There are a variety of student supports available at Keyano. Due to the continuing situation with the Covid-19 pandemic, the offered support services will be implemented through a model to respond to the restrictions in force at the time. In-person and virtual services will be offered. All Alberta Health Services guidelines will be followed for in-person appointments—wear a mask, maintain two meters of physical distance, use hand sanitizer, and stay home if you are unwell.

All student services are available during Keyano business hours: Monday to Friday, 8h30-16h30. The College is closed for statutory holidays. If you require support outside of regular business hours, please inform the support service team, and we will do our best to accommodate your needs.

Accessibility Services: provides accommodations for students with disabilities. Students with documented disabilities, or who suspect a disability, can meet with a Learning Strategist to discuss their current learning barriers and possible accommodations. Students who have accessed accommodations in the past are encouraged to contact us to request them for the semester. Please note that requesting accommodations is a process and requires time to arrange. Contact us as soon as you know you may require accommodations. For accessibility services supports and to book a virtual appointment, please contact accessibility.services@keyano.ca.

Accessibility Services also provides individual and group learning strategy instruction for all students, as well as technology training and supports to enhance learning. Meet with a Learning Strategist to learn studying and test-taking strategies for online classes. Schedule an appointment with the Assistive Technology Specialist to explore technology tools for learning. Book an appointment today by emailing accessibility.services@keyano.ca

Wellness Services: offers a caring, inclusive, and respectful environment where students can access free group and individual support to meet academic and life challenges. Mental Health Coordinators offer a safe and confidential environment to seek help with personal concerns. Students may access services virtually and in-person.

Wellness Services welcomes students to participate in any of the group sessions offered throughout the academic year addressing topics including mindfulness and test anxiety.

Individual appointments can be made by emailing wellness.services@keyano.ca.

Library Services: provides students with research and information supports as they engage in their studies. Library staff are available to support you both online and in-person throughout the semester. For a detailed list of library supports and services, go to www.keyano.ca/library. For all inquiries, please email askthelibrary@keyano.ca or chat with us online.

Begin your research with the [Library's FIND page](#). Search for information and sources for your assignments using the OneSearch, the Library's Catalogue, or by searching in a specific database selected from the [A-Z Database List](#).

Individual support with us is available. For support with citations, research and other information needs, appointments can be booked using the online [Book A Librarian Calendar](#). For support with Moodle, educational tools for assignments, Microsoft Office, Zoom, Teams and more, book an appointment using the online [Educational Technology Support Calendar](#).

Research and subject guides are helpful resources when beginning your research, assignment, using new educational technology, or addressing other information needs. To view a subject or course-specific guide, check out the complete listing of online [Subject Guides](#).

To access additional research resources, including Citation Guides (APA, MLA, Chicago, or IEEE), go to the [Research Help Library page](#).

The Loanable Technology collection is available to support students in their learning pursuits, whether online, in person or both. Items available for borrowing include mobile projectors, webcams, noise-cancelling headphones, Chromebooks, and laptops. For an up-to-date list of technology available for borrowing as well as support available, go to the Library's [Loanable Technology webpage](#).

Academic Success Centre: The Academic Success Centre is a learning space in the Clearwater Campus (CC-119) at Keyano College. Students can gather to share ideas, collaborate on projects, get new perspectives on learning from our Academic Content Specialists, or use the Centre's educational resources. The Academic Success Centre provides academic support services to students registered in credit programs at Keyano College

in the form of individual tutoring, writing support groups, facilitated study groups, workshops, and study space. Services are **free** to Keyano students.

Academic Content Specialists are available in the areas of Math, Science, Human Services, and English/Humanities. This covers all courses offered at Keyano. The Academic Success Coach can also be found in the Academic Success Centre.

For the most up to date information on how to book a session, please view [the Keyano Academic Success Centre homepage](#).

Academic Integrity: The goal of the Academic Success Centre is to foster a student's ability to learn effectively and independently. Students registered at Keyano College are welcome to drop by the Centre to visit with any of our Academic Content Specialists to discuss their academic concerns.

Availability: Monday to Friday: 8:30 a.m. – 4:30 p.m. Flexible times may be available upon request. Virtual and in-person sessions, please email to get in contact with our Academic Content Specialists. For the most up to date information on how to book a session, please view the [Academic Success Centre homepage](#).

Academic Success Coach: offers you support and access to resources for your academic success to help you to find the Keys to your Success. The Academic Success Coach will work with you to develop an academic success plan, develop your study and time management skills, and connect you with the right resources here at Keyano. Academic.success@keyano.ca is the best way to access resources during blended service delivery. The Academic Success Coach is located in the Skill Centre in CC-119 at the Clearwater Campus.

E-Learning

Technology and internet will impact your online learning experience. It's important that you can watch an online video and other course materials, take online quizzes and participate in a live class with your instructor and other students. Live/virtual classes will be hosted in Microsoft Teams or Zoom.

For all course delivery types, you will access your course resources on Keyano's learning management system, **Moodle (iLearn)**. Login in using your [Keyano username and password](#).

Keyano College operates in a Windows based environment, and having the correct tools for online learning is important. Here's a list of recommended system requirements.

Internet Speed

Minimum Internet speeds of 10 Mbps. Recommended Internet speeds of 25 Mbps (especially if you are sharing your internet at home). Check your internet speed with [Fast.com](#).

System requirements:

<p>Minimum Requirements:</p> <p>A Windows 10 or Macintosh (V10.14 and above) computer/laptop</p> <ul style="list-style-type: none"> • Minimum 4GB of RAM. • 10GB+ available hard drive storage. • Enough available hard drive space to install the Microsoft Office suite (approximately 3GB). Microsoft Office software is free to all Keyano students and employees. • Microphone, webcam and speakers. A headset with a microphone is recommended. • System updates must be regularly installed. • Anti-Virus / Anti-Malware software
<p>Recommended Requirements</p> <ul style="list-style-type: none"> • 8GB of RAM • A method of backing up/synchronizing to local or cloud-based storage such as OneDrive is highly recommended. This is included if you complete the setup of KeyanoMail and download MS Office using your Keyano email for free.
<p>Chromebooks are not recommended as they are not compatible with testing lockdown browsers. A Microsoft Surface or iPad or iPad Pro may be possible alternatives in some program areas.</p>

Computer Software

Students can access Microsoft Office 365 for free using Keyano Credentials by [clicking here](#).

Recording of lectures and Intellectual Property

Students may only record a lecture if explicit permission is provided by the instructor or by Accessibility Services. Even if students have permission to record a lecture or lecture materials, students may not publish any of the lectures or lecture materials, this includes any recordings, slides, instructor notes, etc. on any platform. Thus no student is allowed to publish or sell instructor notes without formal written permission. It is important to recognize that the Canadian Copyright Act contains provisions for intellectual property.

ITS Helpdesk

If you are having issues with your student account, you can contact the ITS Helpdesk by emailing its.helpdesk@keyano.ca or calling 780-791-4965.