

**Environmental Technology**

Winter 2021

**ENVT 163A: WATER QUALITY**

*3 credits, 14 weeks, 2 hours lecture per week, 3 hours laboratory per week*

*Course description:* This course provides an overview of water quality protection and pollution control of ground and surface water. Treatment of drinking water and municipal waste water, 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.

*Prerequisite:* CHEM 101 and EAS 100

**Instructor (lectures):**

Dr. Blaine Legaree

Office: S209D

Phone: 780.792.5616

Email: [blaine.legaree@keyano.ca](mailto:blaine.legaree@keyano.ca)

**Office Hours**

Mon/Wed/Fridays 3:00–4:00 pm

Tues/Thursdays 9:30–10:30 am

*or by appointment*

**Instructor (labs):**

Dr. Tamar Richards-Thomas

Office: S209A

Phone: 780.791.4822

Email: [Tamar.RichardsThomas@keyano.ca](mailto:Tamar.RichardsThomas@keyano.ca)

**Office Hours**

Mon/Tues/Wed/Thursdays 1:00-2:00 pm

*or by appointment*

**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 2021 Edition. Keyano College.
2. **Laboratory coat**.
3. **Moodle (<http://ilearn.keyano.ca>)**. The course outline, lecture notes and other resources will be made available on Moodle. \*\*Please download/print lecture notes before coming to class.

### 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.

### 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 may 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	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 Resources and Water Properties	<p>Facts about Water in Alberta:  <a href="https://open.alberta.ca/publications/9780778589709">https://open.alberta.ca/publications/9780778589709</a></p> <p>Government of Canada Water Page:  <a href="https://www.canada.ca/en/services/environment/natural-resources/water.html">https://www.canada.ca/en/services/environment/natural-resources/water.html</a></p> <p>Natural Resources Canada Water Distribution Maps:  <a href="https://www.nrcan.gc.ca/earth-sciences/geography/atlas-canada/selected-thematic-maps/16888">https://www.nrcan.gc.ca/earth-sciences/geography/atlas-canada/selected-thematic-maps/16888</a></p> <p>U.S. Geological Survey's (USGS) Water Resources Page:  <a href="https://www2.usgs.gov/water/">https://www2.usgs.gov/water/</a>  <a href="http://water.usgs.gov/edu/watercycle.html">http://water.usgs.gov/edu/watercycle.html</a>  <a href="http://water.usgs.gov/edu/waterproperties.html">http://water.usgs.gov/edu/waterproperties.html</a>  <a href="http://water.usgs.gov/edu/mearthgw.html">http://water.usgs.gov/edu/mearthgw.html</a></p>
2. Water Chemistry	<p>Water quality units of measurement and parameters:  <a href="http://edis.ifas.ufl.edu/pdf/CH/CH17600.pdf">http://edis.ifas.ufl.edu/pdf/CH/CH17600.pdf</a>  <a href="http://www.philadelphia.edu.io/academics/myounes/uploads/course%20materials/Environmental%20Eng/IV.pdf">http://www.philadelphia.edu.io/academics/myounes/uploads/course%20materials/Environmental%20Eng/IV.pdf</a></p> <p>Milliequivalents are detailed in the notes and also here:  <a href="https://sciencing.com/calculate-milliequivalent-5009675.html">https://sciencing.com/calculate-milliequivalent-5009675.html</a></p> <p>Water Hardness:  <a href="http://dnr.wi.gov/regulations/labcert/documents/training/basics-genchem.pdf">http://dnr.wi.gov/regulations/labcert/documents/training/basics-genchem.pdf</a></p> <p>Alkalinity calculations:  <a href="https://sciencing.com/calculate-alkalinity-caco-5328969.html">https://sciencing.com/calculate-alkalinity-caco-5328969.html</a>  <a href="http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/drinkngwaterlabs/AlkalinityConversions.pdf">http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/drinkngwaterlabs/AlkalinityConversions.pdf</a></p>
3. Water Biology	<p>Waterborne Diseases:  <a href="http://www.phac-aspc.gc.ca/cphorsphc-respcacsp/2013/food-water_alim-eau-eng.php">http://www.phac-aspc.gc.ca/cphorsphc-respcacsp/2013/food-water_alim-eau-eng.php</a>  <a href="http://www.azdhs.gov/phs/oids/epi/waterborne/list.htm">http://www.azdhs.gov/phs/oids/epi/waterborne/list.htm</a>  <a href="https://www.cdc.gov/healthywater/">https://www.cdc.gov/healthywater/</a>  <a href="https://www.healthlinkbc.ca/healthlinkbc-files/water-borne-infections">https://www.healthlinkbc.ca/healthlinkbc-files/water-borne-infections</a>  <a href="http://www.lenntech.com/library/diseases/diseases/waterborne-diseases.htm">http://www.lenntech.com/library/diseases/diseases/waterborne-diseases.htm</a></p> <p>Microbiological Analyses of Water:  <a href="https://www.who.int/water_sanitation_health/resourcesquality/wqmchap10.pdf">https://www.who.int/water_sanitation_health/resourcesquality/wqmchap10.pdf</a></p> <p>Algal blooms:  <a href="https://www.noaa.gov/what-is-harmful-algal-bloom">https://www.noaa.gov/what-is-harmful-algal-bloom</a>  <a href="https://www.albertahealthservices.ca/assets/news/advisories/ne-pha-bga-faq.pdf">https://www.albertahealthservices.ca/assets/news/advisories/ne-pha-bga-faq.pdf</a></p> <p>BOD: <a href="https://secure.caes.uga.edu/extension/publications/files/pdf/C%20992_4.PDF">https://secure.caes.uga.edu/extension/publications/files/pdf/C%20992_4.PDF</a>  <a href="http://www.freedrinkingwater.com/water_quality/quality1/1-bod-effects-on-water-quality.htm">http://www.freedrinkingwater.com/water_quality/quality1/1-bod-effects-on-water-quality.htm</a></p>

4. Laboratory and Field Sampling Methods	Spectrophotometry: <a href="http://chemwiki.ucdavis.edu/Physical_Chemistry/Kinetics/Reaction_Rates/Experimental_Determination_of_Kinetics/Spectrophotometry">http://chemwiki.ucdavis.edu/Physical_Chemistry/Kinetics/Reaction_Rates/Experimental_Determination_of_Kinetics/Spectrophotometry</a> <a href="http://www2.chemistry.msu.edu/faculty/reusch/virttxtjml/spectrpy/uv-vis/spectrum.htm">http://www2.chemistry.msu.edu/faculty/reusch/virttxtjml/spectrpy/uv-vis/spectrum.htm</a> Protocols Manual for Water Quality Sampling in Canada: <a href="http://protocols.ccme.ca/Aquatic_Ecosystems_Field_Sampling_Protocols_(Alberta_Environment)">http://protocols.ccme.ca/Aquatic_Ecosystems_Field_Sampling_Protocols_(Alberta_Environment)</a> <a href="https://open.alberta.ca/publications/077855080x">https://open.alberta.ca/publications/077855080x</a> British Columbia Field Sampling Manual: <a href="https://www2.gov.bc.ca/gov/content/environment/research-monitoring-reporting/monitoring/laboratory-standards-quality-assurance/bc-field-sampling-manual">https://www2.gov.bc.ca/gov/content/environment/research-monitoring-reporting/monitoring/laboratory-standards-quality-assurance/bc-field-sampling-manual</a>
5. Hydraulics and Hydrology	Hydrostatic pressure: <a href="https://youtu.be/COujLqKPWew">https://youtu.be/COujLqKPWew</a> <a href="http://hyperphysics.phy-astr.gsu.edu/hbase/pflu.html">http://hyperphysics.phy-astr.gsu.edu/hbase/pflu.html</a> Continuity Equation: <a href="http://www.aplusphysics.com/courses/honors/fluids/continuity.html">http://www.aplusphysics.com/courses/honors/fluids/continuity.html</a>
6. Water Use and Distribution	Water availability in Canada <a href="https://www.canada.ca/en/environment-climate-change/services/environmental-indicators/water.html">https://www.canada.ca/en/environment-climate-change/services/environmental-indicators/water.html</a> <a href="https://www.iisd.org/ela/blog/commentary/three-major-threats-canadas-fresh-water-iisd-ela-overcome/">https://www.iisd.org/ela/blog/commentary/three-major-threats-canadas-fresh-water-iisd-ela-overcome/</a> Water Use in Canada <a href="https://www150.statcan.gc.ca/n1/pub/16-201-x/16-201-x2017000-eng.htm">https://www150.statcan.gc.ca/n1/pub/16-201-x/16-201-x2017000-eng.htm</a>
7. Water Pollution & Water Quality Standards	Water Pollution: <a href="https://nptel.ac.in/courses/105105048/M10L12.pdf">https://nptel.ac.in/courses/105105048/M10L12.pdf</a> Canadian Drinking Water Guidelines: <a href="https://www.canada.ca/en/health-canada/services/environmental-workplace-health/water-quality/drinking-water/canadian-drinking-water-guidelines.html">https://www.canada.ca/en/health-canada/services/environmental-workplace-health/water-quality/drinking-water/canadian-drinking-water-guidelines.html</a> Solids Measurements: <a href="http://indiawrm.org/HP-1/download/10%20How%20to%20measure%20solids.pdf">http://indiawrm.org/HP-1/download/10%20How%20to%20measure%20solids.pdf</a>
8. Drinking Water Processing	Suez Handbook of Industrial Water Treatment: <a href="https://www.suezwatertechnologies.com/handbook/handbook-industrial-water-treatment">https://www.suezwatertechnologies.com/handbook/handbook-industrial-water-treatment</a>
9. Wastewater Characteristics & Collection	Concerning Reality: How Do Sewer Systems Work? <a href="https://youtu.be/CoFuQZBPCKo">https://youtu.be/CoFuQZBPCKo</a> City of Winnipeg: <a href="http://winnipeg.ca/waterandwaste/sewage/systemOperation.stm">http://winnipeg.ca/waterandwaste/sewage/systemOperation.stm</a> Institute for Water Education: <a href="https://ocw.un-ihe.org/mod/resource/view.php?id=405">https://ocw.un-ihe.org/mod/resource/view.php?id=405</a>
10. Wastewater Processing	<a href="http://www.fao.org/docrep/t0551e/t0551e05.htm">http://www.fao.org/docrep/t0551e/t0551e05.htm</a> <a href="http://www.calgary.ca/UEP/Water/Pages/Water-and-wastewater-systems/Wastewater-system/Wastewater-treatment-tour.aspx">http://www.calgary.ca/UEP/Water/Pages/Water-and-wastewater-systems/Wastewater-system/Wastewater-treatment-tour.aspx</a> <a href="https://guelph.ca/wp-content/uploads/IntroductionToWastewater.pdf">https://guelph.ca/wp-content/uploads/IntroductionToWastewater.pdf</a> <a href="http://www.scientificamerican.com/article/treating-sewage/">http://www.scientificamerican.com/article/treating-sewage/</a>
11. Air Quality	NASA Global Climate Change: <a href="https://climate.nasa.gov/">https://climate.nasa.gov/</a> Canadian Council of Ministers of the Environment: Canada's Air: <a href="http://airquality-qualitedelair.ccme.ca/en/">http://airquality-qualitedelair.ccme.ca/en/</a>

*\*\*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.

## 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.

### 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.

### 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 Certificate at [ilearn.keyano.ca](http://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 College. Due to the continuing situation with the COVID-19 pandemic, the offered support services will be implemented differently this semester by being provided mostly virtually. In-person service can be requested as needed. 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.

**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](mailto: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](mailto: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. All individual appointments will continue virtually.

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

Individual virtual appointments can be made by emailing [wellness.services@keyano.ca](mailto: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 virtually and in person throughout the semester. For a detailed list of library supports and services, go to [www.keyano.ca/library](http://www.keyano.ca/library). For any inquiries, please email [askthelibrary@keyano.ca](mailto:askthelibrary@keyano.ca).

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

Individual support with the Information Librarian is available virtually. Appointments can be requested by using the [Book A Librarian online form](#).

Research and Subject Guides are helpful resources when beginning your research or addressing other information needs. To view a subject or course specific guide, go to the Subject Guide webpage [here](#).

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 online learning pursuits. 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, go to the Library's [Loanable Technology webpage](#).

**Skill Centre:** provides academic support services to students registered in credit programs at Keyano College in the form of tutoring, assignment/lab support, writing support groups, facilitated study groups, workshops, and study space. This service is free and is available for all Math, Sciences, Humanities and Trades courses offered at Keyano.

While most courses are being offered online, the Skill Centre will be offering mostly virtual services and in-person sessions as requested. Please email [Skill@keyano.ca](mailto:Skill@keyano.ca) to get in contact with our Academic Content Specialists. The Skill Centre is located in CC-119 at the Clearwater Campus.

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

**Academic Success Coaching:** 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](mailto:Academic.success@keyano.ca) is the best way to access resources during virtual 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 are able to watch an online video and other course materials, take online quizzes, and participant in a live class with your instructor and other students.

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 for Fall 2020.

### Internet Speed

Minimum Internet speeds of 5 Mbps. Recommended Internet speeds of 25 Mbps (especially if you are sharing your internet at home). Check your internet speed with [Fast.com](http://Fast.com).

### System requirements:

Microsoft Windows	Apple
<p><b>Minimum Requirements:</b></p> <p>A Windows 10 <b>computer/laptop</b></p> <ul style="list-style-type: none"> <li>• Minimum 4GB of RAM.</li> <li>• 10GB+ available hard drive storage.</li> <li>• Enough available hard drive space to install the Microsoft Office suite (approximately 3GB). <a href="#">Microsoft Office</a> software is free to all Keyano students and employees.</li> <li>• Microphone, webcam and speakers. A headset with a microphone is recommended.</li> <li>• System updates must be regularly installed.</li> <li>• Anti-Virus / Anti-Malware software</li> </ul>	<p><b>Minimum Requirements:</b></p> <p>A Macintosh (V10.14 and above) <b>computer/laptop</b></p> <ul style="list-style-type: none"> <li>• Minimum 4GB of RAM.</li> <li>• 10GB+ available hard drive storage.</li> <li>• Enough available hard drive space to install the Microsoft Office suite (approximately 3GB). <a href="#">Microsoft Office</a> software is free to all Keyano students and employees.</li> <li>• Microphone, webcam and speakers. A headset with a microphone is recommended.</li> <li>• System updates must be regularly installed.</li> <li>• Anti-Virus / Anti-Malware software</li> </ul>

<p><b>Recommended Requirements</b></p> <ul style="list-style-type: none"> <li>• 8GB of RAM</li> <li>• 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.</li> </ul>	<p><b>Recommended Requirements</b></p> <ul style="list-style-type: none"> <li>• 8GB of RAM</li> <li>• 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.</li> </ul>
<p>Chromebooks are <b>not</b> 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>	

**Specific department requirements:**

Business and OA programs require Windows 10.  
Other programs may utilize Windows based tools as well.

**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 share, distribute, or 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 share, distribute, publish or sell course related content (instructor, or students) without permission. It is important to recognize that the Canadian Copyright Act contains provisions for intellectual property. The [Academic Integrity Policy](#) provides additional information on Keyano College's expectations from students as members of the intellectual community.

**ITS Helpdesk**

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