

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

Dr. Sean Fenwick

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Office Hours

Tuesdays 10:00 AM – 12:00 PM

Wednesdays 10:00 AM – 11:00 AM

Thursdays 10:00 AM – 12:00 PM

Hours of Instruction

Lecture: Mondays/Wednesdays 2:00 – 2:50 PM CC-283

Laboratory: Tuesdays 2:00 – 4:50 PM S114, CC236, or Computer lab (TBA)

Required Resources

1. **ENVT 163 Laboratory Manual**. Winter 2020 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

Midterms (2)	40%	20% each; 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	
	Progression	C-	1.7	
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: https://open.alberta.ca/publications/9780778589709</p> <p>Government of Canada Water Page: https://www.canada.ca/en/services/environment/natural-resources/water.html</p> <p>Natural Resources Canada Water Distribution Maps: https://www.nrcan.gc.ca/earth-sciences/geography/atlas-canada/selected-thematic-maps/16888</p> <p>U.S. Geological Survey's (USGS) Water Resources Page: https://www2.usgs.gov/water/ http://water.usgs.gov/edu/watercycle.html http://water.usgs.gov/edu/waterproperties.html http://water.usgs.gov/edu/mearthgw.html</p>
2. Water Chemistry	<p>Water quality units of measurement and parameters: http://edis.ifas.ufl.edu/pdf/CH/CH17600.pdf http://www.philadelphia.edu.io/academics/myounes/uploads/course%20materials/Environmental%20Eng/IV.pdf</p> <p>Milliequivalents are detailed in the notes and also here: https://sciencing.com/calculate-milliequivalent-5009675.html</p> <p>Water Hardness: http://dnr.wi.gov/regulations/labcert/documents/training/basics-genchem.pdf</p> <p>Alkalinity calculations: http://www.ehow.com/how_5328969_calculate-alkalinity-caco.html http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/drinkngwaterlabs/AlkalinityConversions.pdf</p>
3. Water Biology	<p>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 https://www.cdc.gov/healthywater/ https://www.healthlinkbc.ca/healthlinkbc-files/water-borne-infections http://www.lenntech.com/library/diseases/diseases/waterborne-diseases.htm</p> <p>Microbiological Analyses of Water: https://www.who.int/water_sanitation_health/resourcesquality/wqmchap10.pdf</p> <p><i>Algal blooms:</i> https://www.noaa.gov/what-is-harmful-algal-bloom https://www.albertahealthservices.ca/assets/news/advisories/ne-pha-bqa-faq.pdf</p> <p>BOD: http://www.polyseed.com/misc/BODforwebsite.pdf http://www.freedrinkingwater.com/water_quality/quality1/1-bod-effects-on-water-quality.htm</p>
4. Laboratory and Field Sampling Methods	<p>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</p> <p>PROTOCOLS MANUAL FOR WATER QUALITY SAMPLING IN CANADA http://www.ccm.ca/files/Resources/water/water_quality/protocols_document_e_final_101.pdf</p> <p>Aquatic Ecosystems Field Sampling Protocols (Alberta Environment) https://open.alberta.ca/publications/077855080x</p> <p>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</p>
5. Hydraulics and Hydrology	<p>Hydrostatic pressure: https://youtu.be/KAvy5P88lms https://youtu.be/COujLqKPWew http://hyperphysics.phy-astr.gsu.edu/hbase/pflu.html</p> <p>Continuity Equation:</p>

	http://www.aplusphysics.com/courses/honors/fluids/continuity.html
6. 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
7. Water Pollution & Water Quality Standards	Water Pollution: https://nptel.ac.in/courses/105105048/M10L12.pdf 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 Measurements: http://indiawrm.org/HP-1/download/10%20How%20to%20measure%20solids.pdf
8. Drinking Water Processing	Suez Handbook of Industrial Water Treatment: https://www.suezwatertechnologies.com/handbook/handbook-industrial-water-treatment City of Winnipeg Drinking Water Treatment Plant: https://youtu.be/20VvpASC2sU
9. Wastewater Characteristics & Collection	Concerning Reality: How Do Sewer Systems Work? https://youtu.be/CoFuQZBPCKo City of Winnipeg: http://winnipeg.ca/waterandwaste/sewage/systemOperation.stm Institute for Water Education: https://ocw.un-ihe.org/mod/resource/view.php?id=405
10. 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/
11. 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/

***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.

More specific 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.

Laboratory Safety

In the science laboratories, safety is important and therefore 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 students' 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 tutorial found on 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 Academic Support Services (SASS) department: Accessibility Services, Skill Centre, Wellness Services and Student Life Department work together to support student success at Keyano College.

Accessibility Services (CC167) supports student success through group and individualized instruction of learning, study and test taking strategies, and adaptive technologies. Students with documented disabilities, or who suspect a disability, can meet with the Learning Strategists to discuss accommodation of the learning barriers that they may be experiencing. Students who have accessed accommodations in the past are encouraged to visit our office at their earliest opportunity to discuss the availability of accommodations in their current courses. Individual appointments can be made by calling 780-791-8934.

Skill Centre (CC119) provides a learning space where students can gather to share ideas, collaborate on projects and get new perspectives on learning from our tutorial staff. Students visiting

the centre have access to one-to-one or group tutoring, facilitated study groups, and assistance in academic writing. The Skill Centre's Peer Tutor program provides paid employment opportunities for students who have demonstrated academic success and want to share what they have learned. Tutoring is available free to any students registered at Keyano College on a drop in basis, from 8:30 am to 5:00 pm Monday through Friday. Additional evening hours are subject to tutor availability and are posted in the Skill Centre.

Wellness Services (CC260) 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. The Mindfulness Room in CC260 is available as a quiet space for students to relax during regular office hours. Wellness Service welcomes students to participate in any of the group sessions offered throughout the academic year addressing such topics as Mindfulness and Test Anxiety. Individual appointments can be made by calling 780-791-8934.

Student Life Department (CC210) is a place for students to go when they don't know who else can answer their questions. The staff will help students navigate barriers to success and if they don't know the answer, they will find it out. Student success is directly affected by how connected a student feels to their college. The student life department is there to help students get connected.

Please watch your Keyano email for workshop announcements from our Student Academic Support Services team.