

I. COURSE DESCRIPTION: This course is designed to meet the requirements of the Ministry of Environment for those planning to become operators in drinking water plants. The material represents what new operators should learn at the beginning of their careers based on a training needs assessment. The course will provide new operators with a basic understanding of water characteristics and pathogens, treatment and distribution processes and the regulations that govern water quality. Some topics which will be tested in the Ministry exam will have been covered in detail in other courses. They are listed here as a reference when preparing for the exam.

II. LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE:

Upon successful completion of this course, the student will demonstrate the ability to:

1. Apply knowledge gained to protect the health of the public.
Potential Elements of the Performance:
 1. Explain the effects of improper treatment, including, disinfection on public health.
 2. Define and describe micro-organisms commonly found in water.
 3. Describe pathogens: viruses, bacteria (*E. coli*, coliform), protozoa (*Cryptosporidium*, *Giardia*).
 4. Identify how chemicals are regulated in Ontario as per Schedules 23 and 24 (O.Reg.170/03) and O. Reg. 169/03.
 5. List chemical contaminants in drinking water and describe their effects on human health.
 6. Outline the importance of the role of the water operator
 7. Define "indicator organism"
2. List and apply regulations governing water quality.
Potential Elements of the Performance:
 1. List key drinking water regulations
 2. Explain the role of an operator as set out in O.Reg. 170/03
 3. Outline alarm requirements as set out in O.Reg. 170/03
 4. Define "Adverse Result"
 5. Explain the notification requirements and corrective actions required following an adverse result
3. Solve water related math problems, read and interpret drawings.
Potential Elements of the Performance:
 1. Perform math calculations applicable to the water treatment industry including unit conversions, area volume and flow,

- chemical dosage feeds and discharge rates.
 2. Interpret operational parameters obtained from graphs and charts.
 3. Use plan and sectional views from drawings be able to determine locations of equipment and interpret schematics.
 4. Use maps to calculate distances using scale.
4. Evaluate water characteristics and sources.
- Potential Elements of the Performance:
1. Define pH and discuss its effects on water processes.
 2. Define hardness and explain its effects on water processes.
 3. Define alkalinity and explain its importance.
 4. Describe commonly occurring elements in water (iron, manganese).
 5. Describe the water cycle and how it affects water sources.
 6. Discuss different sources of surface water.
 7. Describe general regulations for surface water and groundwater.
 8. Identify factors that affect surface water quality – algae, and zebra mussels.
 9. Discuss why and how it is treated – chemically assisted filtration (or equivalent) and disinfection (inactivation).
 10. Describe why GUDI water is treated as surface water.
 11. Discuss source water protection.
5. Describe the key aspects of disinfection and treatment.
- Potential Elements of the Performance:
1. State the purpose of disinfection, and different types of disinfection.
 2. List the minimum disinfection requirements for surface water and ground water sources.
 3. Discuss the types of disinfectants, and the principles for each type.
 4. List the factors that affect disinfection.
 5. Calculate chlorine dosage and residuals.
 6. Describe jar testing.
 7. Discuss general filter maintenance.
 8. Describe types and function of backwash systems.
 9. Describe types and function of aeration systems.
 10. Explain the significance of fluoridation of drinking water.
 11. Describe the treatment methods used to deal with taste and odour problems in drinking water supplies.
 12. Identify and describe the various iron and manganese treatment processes, including sodium silicate, green sand filtration and oxidation by chlorine or potassium

permanganate.

13. Explain why iron and manganese processes are sometimes needed in some drinking water systems.

6. Perform sampling and select proper equipment.

Potential Elements of the Performance:

1. Identify proper sample holding time.
2. State when to rinse and when not to rinse sample bottles.
3. Identify sampling bottles.
4. Describe how to care for, store, package and deliver samples using correct procedures.
5. Describe how a proper microbiological sample is taken.
6. Take samples for total coliform and/or *E. coli*, using proper sampling procedures.
7. Describe how to take samples for organic and inorganic parameters.
8. Describe and demonstrate use of basic lab equipment: auto titrators, pipettes, glassware, hot plates, spectrophotometers, automatic stirrers.
9. Demonstrate use of portable units for the field, using the right glassware for the sample.
10. Demonstrate use of DPD.
11. Explain why the presence of manganese might lead to erroneous DPD or chlorine residual readings.
12. Demonstrate use of amperometric titration.
13. Perform calibration checks.
14. Describe and demonstrate proper use of turbidimeter.
15. Describe why and how a pH sample is taken.
16. Describe possible interferences (fluoride, different ions, temperature) that can affect pH analysis.
17. Describe the difference between true and apparent colour.
18. Perform colour analysis with comparison tubes.
19. Use spectrophotometer accurately, both portable and bench meters.

7. List well types and describe well operations.

Potential Elements of the Performance:

1. Describe the basic requirements of Reg. 903/90 as it pertains to well operation
2. Define the types of well and their components including geological structure, terminology and the basics of well construction.
3. Describe the various pumping systems including elements of operation and maintenance of both well and mechanical

components.

8. Describe the components, techniques and procedures to provide in the water distribution system.
 1. Explain the purpose of cathodic protection for ductile iron and cast iron pipes.
 2. Describe the different approaches used for corrosion control, including anodes, sequestering agents and softening and removal agents.
 3. Describe how to inspect, clean and maintain water storage reservoirs according to a standard operating procedure.
 4. Explain the purpose for lining pipes with epoxy or cement.
 5. Describe types of pipe breaks, including pinhole, blow-outs and circumferential.
 6. Describe the calibration schedule for different metering devices.
 7. Describe the different soil types encountered when trenching or excavating a site.
 8. Describe the kinds of shoring that are required when excavating or trenching a site.
 9. Describe trenching and shoring boxes, how they are used, and general maintenance.
 10. Describe the different backfill materials and bedding materials used when trenching or excavating a site.
 11. Describe the equipment used at a trench site, such as backhoes and excavators.
 12. Describe types of drilling machines, how they are used, and general maintenance.
 13. Describe torpedoes (boring machines), how they are used, and general maintenance.
 14. Describe tapping machines, how they are used, and general maintenance.
 15. Describe dewatering pumps, how they are used, and general maintenance.
 16. Describe jackhammers, how they are used, and general maintenance.
 17. Describe chop saws and chain saws, how they are used, and general maintenance.
 18. Describe small distribution tools, how they are used, and general maintenance.
 19. Describe locators – magnetic, battery-operated, how they are used, and general maintenance.

9. List and apply safe workplace practices.
 1. Apply key lessons learned in the self study component with respect to safety.
 2. Explain the key actions that a water operator can take to increase safety.

III. TOPICS:

1. Protecting the health of the public
2. Regulations governing water quality
3. Water related math and drawings
4. Water characteristics and sources
5. Disinfection and treatment
6. Sampling and equipment
7. Well operations
8. Water Distribution
9. Safety

IV. REQUIRED RESOURCES/TEXTS/MATERIALS:

Self Study Guide and Classroom Manual for the Entry Level Course for Drinking Water Operators. Current edition
Available in bookstore.

V. EVALUATION PROCESS/GRADING SYSTEM:

Tests 1 - 20%, Test 2 - 20% and Test 3 - 40%
Assignments/quizzes worth 20%.

The final test will represent the required evaluation as prescribed by the Ministry of Environment and will be submitted to them as evidence of satisfactory of the entry course requirements.

The following semester grades will be assigned to students:

Grade	<u>Definition</u>	<i>Grade Point Equivalent</i>
A+	90 – 100%	4.00
A	80 – 89%	3.00
B	70 - 79%	3.00
C	60 - 69%	2.00
D	50 – 59%	1.00
F (Fail)	49% and below	0.00

CR (Credit)	Credit for diploma requirements has been awarded.
S	Satisfactory achievement in field /clinical placement or non-graded subject area.
U	Unsatisfactory achievement in field/clinical placement or non-graded subject area.
X	A temporary grade limited to situations with extenuating circumstances giving a student additional time to complete the requirements for a course.
NR	Grade not reported to Registrar's office.
W	Student has withdrawn from the course without academic penalty.

VII. SPECIAL NOTES:

Disability Services:

If you are a student with a disability (e.g. physical limitations, visual impairments, hearing impairments, or learning disabilities), you are encouraged to discuss required accommodations with your professor and/or the Disability Services office. Visit Room E1101 or call Extension 2703 so that support services can be arranged for you.

Retention of Course Outlines:

It is the responsibility of the student to retain all course outlines for possible future use in acquiring advanced standing at other postsecondary institutions.

Communication:

The College considers WebCT/LMS as the primary channel of communication for each course. Regularly checking this software platform is critical as it will keep you directly connected with faculty and current course information. Success in this course may be directly related to your willingness to take advantage of the Learning Management System communication tool.

Plagiarism:

Students should refer to the definition of “academic dishonesty” in Student Code of Conduct. Students who engage in academic dishonesty will receive an automatic failure for that submission and/or such other penalty, up to and including expulsion from the course/program, as may be decided by the professor/dean. In order to protect students from inadvertent plagiarism, to protect the copyright of the material referenced, and to credit the author of the material, it is the policy of the department to employ a documentation format for referencing source material.

Course Outline Amendments:

The professor reserves the right to change the information contained in this course outline depending on the needs of the learner and the availability of resources.

Substitute course information is available in the Registrar's office.

Tuition Default:

Students who have defaulted on the payment of tuition (tuition has not been paid in full, payments were not deferred or payment plan not honoured) as of the first week of March, will be removed from placement and clinical activities. This may result in loss of mandatory hours or incomplete course work. Sault College will not be responsible for incomplete hours or outcomes that are not achieved or any other academic requirement not met as of the result of tuition default. Students are encouraged to communicate with Financial Services with regard to the status of their tuition prior to this deadline to ensure that their financial status does not interfere with academic progress.

VIII. PRIOR LEARNING ASSESSMENT:

Students who wish to apply for advance credit transfer (advanced standing) should obtain an Application for Advance Credit from the program coordinator (or the course coordinator regarding a general education transfer request) or academic assistant. Students will be required to provide an unofficial transcript and course outline related to the course in question.

Credit for prior learning will also be given upon successful completion of a challenge exam or portfolio