

Western University  
Faculty of Engineering  
*Department of Civil/Environmental Engineering*

CEE 9692a- DRINKING WATER QUALITY AND TREATMENT

COURSE OUTLINE 2021-2022

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**DESCRIPTION**

The course develops graduate level concepts for the examination of drinking water quality and discussion of state-of-the-art technologies for treating drinking water. The motivation for the course is the recent recognition that infrastructure and facilities for delivering safe, clean, and adequate supplies of drinking water to citizens are either inadequate or susceptible to failure.

**LECTURE TOPICS:**

1. Meeting New Regulations
2. Recent Outbreaks
3. Requirements for Disinfection
4. Conventional Water Treatments Systems
  - a) Screening, Coagulation, Flocculation, and Clarification
  - b) Activated Carbon Adsorption
  - c) Ion Exchange
  - d) Fluoridation
  - e) Chlorination
5. Advanced Water Treatment Systems
  - a) Ozone
  - b) Membranes
  - c) Ultra-Violet (UV)
6. Sand Filtration Process
7. Particle Counting and Other Methods of Water Quality Characterization

## TOPICS

Topic #	Description	Learning Activities	Tentative timeline
1	Lesson 1: Introduction: Walkerton inquiry	In class lecture	Aug. 2
2	Lesson 2: Alkalinity, Turbidity, Hardness, Conventional treatment Assignment 1	<ul style="list-style-type: none"> <li>In class lecture</li> <li>Assignment 1</li> </ul> OWL online quiz 1 (6:30pm)	Aug. 4
3	OWL online quiz 1 (10:00 am)	<ul style="list-style-type: none"> <li></li> </ul>	Aug 5
4	Lesson 3: Water filtration	<ul style="list-style-type: none"> <li>In class lecture</li> </ul>	Aug 8
5	Walkerton Training Group 1	Trip to Walkerton Clean Water Center (WCWC)	Aug 9
6	Walkerton training Group 2	Trip to Walkerton Clean Water Center (WCWC)	Aug 10
7	Lesson 4: Adsorption Tutorial Assignment 2	<ul style="list-style-type: none"> <li>Assignment 2</li> </ul> OWL online quiz 2 (6:30pm)	Aug 11
8	OWL online quiz 2 (10:00am) OWL online quiz 3 (10:30am)	OWL online quiz 2 and quiz 3	Aug 12
9	Lesson 5: Chlorine disinfection	<ul style="list-style-type: none"> <li>In class lecture</li> </ul>	Aug 15
10	Lesson 6: Ozone and UV disinfection	<ul style="list-style-type: none"> <li>In class lecture</li> </ul>	Aug 16
11	Tutorial- Assignment 3	<ul style="list-style-type: none"> <li>Assignment 3</li> </ul>	Aug 18
12	OWL online quiz 4 (10:00am) OWL online quiz 5 (10:30am)	OWL Online Quiz 4 and Quiz 5	Aug 19
13	Tour to water treatment plant	Lake Huron and Elgin Area Water Systems	Aug 22
14		<ul style="list-style-type: none"> <li>In class lecture</li> </ul>	Aug 23

	Lesson 7: Membrane Separation		
15	Tutorial Assignment 4 Test review	• Assignment 4	Aug 25
16	OWL online quiz6 (10:00am)	OWL online quiz6	Aug 26
17	Final test		Aug 29

### SPECIFIC LEARNING OUTCOMES

Degree Level Expectation	Weight	Assessment Tools	Outcomes
<b>Depth and breadth of knowledge</b>	35%	<ul style="list-style-type: none"> <li>Examinations</li> <li>Assignments</li> <li>Quizzes</li> </ul>	<ul style="list-style-type: none"> <li>Understanding of advanced concepts and theories</li> <li>Awareness of important current problems in the field of study</li> <li>Understanding of computational and/or empirical methodologies to solve related problems</li> </ul>
<b>Research &amp; scholarship</b>	15%	<ul style="list-style-type: none"> <li>Project (Walkerton Report)</li> </ul>	<ul style="list-style-type: none"> <li>Ability to conduct critical evaluation of current advancements in the field of specialization</li> <li>Ability to conduct coherent and thorough analyses of complex problems using established techniques/principles and judgment</li> </ul>
<b>Application of knowledge</b>	25%	<ul style="list-style-type: none"> <li>Assignments</li> <li>Quizzes</li> </ul>	<ul style="list-style-type: none"> <li>Ability to apply knowledge in a rational way to analyze a particular problem</li> <li>Ability to use coherent approach to design a particular engineering system using existing design tools</li> </ul>
<b>Professional capacity / autonomy</b>	5%	<ul style="list-style-type: none"> <li>Assignments</li> <li>Quizzes</li> </ul>	<ul style="list-style-type: none"> <li>Awareness of academic integrity</li> <li>Ability to implement established procedures and practices in the coursework</li> <li>Defends own ideas and conclusions</li> <li>Integrates reflection into his/her learning process</li> </ul>
<b>Communication skills</b>	15%	<ul style="list-style-type: none"> <li>Project (Walkerton Report)</li> </ul>	<ul style="list-style-type: none"> <li>Ability to communicate (oral and/or written) ideas, issues, results and conclusions clearly and effectively</li> </ul>
<b>Awareness of limits of knowledge</b>	10%	<ul style="list-style-type: none"> <li>Project</li> <li>Assignments</li> </ul>	<ul style="list-style-type: none"> <li>Awareness of the need of assumptions in complex scientific analyses and their consequences</li> <li>Understanding of the difference between theoretical and empirical approaches</li> <li>Ability to acknowledge analytical limitation due to complexity of practical problems</li> </ul>

## ASSESSMENTS

Assessment Type	Material Covered	Tentative Due Date	Weight
Homework Assignments (four)	Topic 1 to 15		24%
Multiple Choice Quizzes (six)	Topics 1 to 15		31%
Term tests (two)	Topics 1-3 and topics 4-6		30%
Project	Walkerton report project Topics 5, 6, 7		15%

**All classes are in person: Start at 8:30 am to 11:30am-**

**Quizzes (OWL Quiz) are on Fridays at 10:00 am and 10:30am. It takes between 15 to 20min- (Students take online quizzes in the same time)**

**All assignments are due following Monday after each tutorial in OWL assignment drop box at 4pm**

**August 9 and 10, students will go to Walkerton Clean Water Center (WCWC) for one-day training (8:30am to 4:30pm). The bus will leave campus at 6:30 am**

**Walkerton (WCWC) report due on Monday August 22<sup>th</sup> at 4pm in OWL assigned drop box**

**August 23rd, Tour to Lake Huron and Elgin Area Water Systems**

**Final test: Test starts at 8:30am to 11:30am, on Monday Aug 29th.**

## CONTACT INFORMATION

Course instructor: S. Bahrami

Email address: sbahram2@uwo.ca

Contact policy:

- Contact instructor via email (above) or through messages in OWL
- Weekly Office hours are held via Zoom if needed
- A general FAQ section on the 'forums' section of OWL will be used for students to pose course-related questions so that all have the same information.

## REQUIRED TEXTBOOK

List required textbook(s), All course material will be posted in OWL during the course

## REQUIRED BACKGROUND

Students must have knowledge of engineering Fluid Mechanics and Hydraulic,

## COURSE CONTENT

The lecture notes and online lecture videos are copyrighted to the instructor and legally protected. Do not post these videos and lecture notes on any other website or online forums. The recording of

the live/synchronous sessions of the course without the permission from the instructor is prohibited. The illegal posting and sharing of the copyrighted course content could be subjected to legal actions.

### **CHEATING, PLAGIARISM/ACADEMIC OFFENCES**

Academic integrity is an essential component of learning activities. Students must have a clear understanding of the course activities in which they are expected to work alone (and what working alone implies) and the activities in which they can collaborate or seek help; see information above under “Assessments” and ask instructor for clarification if needed. Any unauthorized forms of help-seeking or collaboration will be considered an academic offense. University policy states that cheating is an academic offence. If you are caught cheating, there will be no second warning. Students must write their essays and assignments in their own words. Whenever students take an idea or a passage of text from another author, they must acknowledge their debt both by using quotation marks where appropriate and by proper referencing such as footnotes or citations. Plagiarism is a major academic offence. Academic offences are taken seriously and attended by academic penalties which may include expulsion from the program. Students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence (see Western's scholastic discipline regulations for graduate students).

### **SYNCHRONOUS LEARNING ACTIVITIES**

Students are expected to participate in synchronous learning activities as outlined in the course syllabus and/or described by the instructor. If you have issues that will impede your ability to participate in synchronous activities, please discuss with the course instructor at the beginning of the course.

### **CONDUCT**

Students are expected to follow proper etiquette during synchronous and asynchronous activities to maintain an appropriate and respectful academic environment. Any student who, in the opinion of the instructor, is not appropriately participating in the synchronous and asynchronous learning activities and/or is not following the rules and responsibilities associated with the online learning activities, will be reported to the Associate Dean (Graduate) (after due warning has been given). On the recommendation of the Department concerned, and with the permission of the Associate Dean (Graduate), the student could be debarred from completing the assessment activities in the course as appropriate.

### **HEALTH/WELLNESS**

As part of a successful graduate student experience at Western, we encourage students to make their health and wellness a priority. Western provides several health and wellness related services (remotely accessible) to help you achieve optimum health and engage in healthy living while pursuing your graduate degree. Information regarding health- and wellness-related services available to students may be found at <http://www.health.uwo.ca/>.

Students seeking help regarding mental health concerns are advised to speak to someone they feel comfortable confiding in, such as their faculty supervisor, their program director (graduate chair), or other relevant administrators in their unit. Campus mental health resources may be found at [http://www.health.uwo.ca/mental\\_health/resources.html](http://www.health.uwo.ca/mental_health/resources.html)  
<https://www.uwo.ca/health/psych/index.html>

**SICKNESS**

Students should immediately consult with the Instructor (for a particular course) or Associate Chair (Graduate) (for a range of courses) if they have problems that could affect their performance. The student should seek advice from the Instructor or Associate Chair (Graduate) regarding how best to deal with the problem. Failure to notify the Instructor or the Associate Chair (Graduate) immediately (or as soon as possible thereafter) will have a negative effect on any appeal. Obtaining appropriate documentation (e.g., a note from the doctor) is valuable when asking for accommodation due to illness.

**ACCESSIBILITY**

Please contact the course instructor if you require material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Accessible Education at 661-2111 x 82147 or [http://academicsupport.uwo.ca/accessible\\_education/index.html](http://academicsupport.uwo.ca/accessible_education/index.html), for any specific question regarding an accommodation.