



## Course Description:

Sources, characteristics and treatment techniques for water and wastewater generated from various (industrial and municipal) sources. Emphasis will be on water and wastewater treatment processes, such as disinfection, chemical oxidation, coagulation/flocculation, sedimentation, substrate utilization kinetics, biological wastewater treatment (activated sludge and trickling filters), and resource recovery.

## Course Objectives:

To help students

- develop the ability to apply basic understandings of physical, chemical, and biological unit operations and processes commonly used in water and wastewater treatment plants.
- develop an appreciation and general understanding of the social and regulatory aspects of managing and delivering water and the multi-disciplinary nature of the field

<b><u>Evaluation:</u></b>	Assignments *	15
	Tutorials / Quiz **	15
	Mid-term ***	25
	Final Exam	45
	Total	100

\* There will be 4 assignments given throughout the course. Assignments should be submitted, by 5:00 pm PST on or before the due date, through Canvas.

\*\* There will be 4 short quizzes throughout the term (during the tutorial sessions). Each quiz will consist of a number of short or multiple choice questions. Tutorial marks will be based on the participation in the session, contributions to the teams, and working on the specific problems during the session.

\*\*\* The mid-term exam will be given on **Thursday Oct. 27th**. Missing the exam due to medical reasons would be accommodated based on the UBC Academic Concession (Policy V135): <https://academicservices.engineering.ubc.ca/form-request-for-academic-concession-in-term-work/>). If you feel ill, email me or the TA as soon as you are confident you should not come to the scheduled exam. Do not come to class if you are ill.

For additional information about academic concessions, see the UBC policy here: <http://www.calendar.ubc.ca/vancouver/index.cfm?tree=3,329,0,0>

*Note:*

Students who wish to have an academic accommodation because of a disability are advised to contact Centre for Accessibility <<http://https://students.ubc.ca/about-student-services/centre-for-accessibility>>

**Final Exam:** The final exam will be given during the final exam period (details to be provided later).

**If you are sick on a final exam day,** do not attend the exam. You must apply for deferred standing (an academic concession) through Engineering Academic Services no later than 48 hours after the missed final exam/assignment. Students who are granted deferred standing write the final exam/assignment at a later date.

**Special notes:**

- Please join us in working towards a class culture where everyone feels welcome and valued. A comprehensive list of resources from the Equity and Inclusion Office is here: <https://equity.ubc.ca/resources/>. We strive to create a safe learning environment for all. If you feel there is a course issue that is a barrier to your learning, please let us know. You can also contact the ombudsperson for help: <https://ombudsoffice.ubc.ca/>.
- Taking care of your mental health and wellbeing helps improve your academic performance. UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access. Visit <https://students.ubc.ca/health> for resources, strategies, and services to enhance your mental and physical health.
- UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic freedom. We are committed to equity, diversity, and inclusion, and provide appropriate accommodation for students with disabilities and for religious observances.
- UBC values academic honesty and students are expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all of their actions. Details of the policies and how to access support are available on <https://senate.ubc.ca/>
- All classes are planned to be in person. We will continue to follow COVID-19 policy updates on <https://covid19.ubc.ca/>
- All assignments and quizzes will be submitted on-line through Canvas. Only mid-term and final exams will be written on paper.
- If I am ill and/or not able to attend the class in person, arrangements will be made for an alternative instructor or the TA to lead the class.
- If you miss classes due to illness, try to do the followings:
  - Make a connection early in the term to another student or a group of students in the class so that you can ask what was missed.
  - Consult the class resources including the lecture notes on Canvas. We will post all the slides and readings, for each class day.
  - Come to virtual office hours.

**Academic Integrity**

You should not cheat, copy, plagiarize or mislead others with respect to your individual work. All your submissions should be original work undertaken by you alone (except for team

assignments), with attribution given as appropriate to all other sources of information and ideas. In examinations, you should not seek aid from others, nor give aid to others, nor make use of unauthorized materials or aids. More generally, you are deemed to be aware of and adhere to the relevant University regulations as provided in [Campus-wide Policies and Regulations - Vancouver Academic Calendar 2022/23 - UBC Student Services](#), and in particular those relating to Academic Honesty and Standards and to Student Conduct and Discipline. All cases of suspected academic misconduct must be reported to the Dean's Office.

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Classes may not be recorded without prior permission from the instructions.

**CLASS SCHEDULE (tentative - subject to change)**

Week 1		<b>Introduction to the Course</b>
	Topics:	Context and scope; water facts, use and consumption
Week 2		<b>Water and Wastewater Characteristics</b>
	Topics:	Water and wastewater quality parameters, classifications of water and wastewater, water quality and pollution
Week 3		<b>Water and Wastewater Characteristics (cont'd)</b> <b>Regulations and overview of water treatment processes</b>
	Topics:	Regulation and policies around water and wastewater
Week 4		<b>Water Microbiology</b>
	Topics:	Microbiological quality of water and wastewater, techniques for microbial assays
Week 5		<b>Physico-chemical treatment</b>
	Topics:	Flow equalization, Coagulation and flocculation
Week 6		<b>Physical treatment - Clarification</b>
	Topics:	Sedimentation
Week 7		<b>Chemical oxidation</b>
	Topics:	Ozone and peroxide based oxidation processes
Week 8		<b>Ion Exchange</b>
	Topics	Theory of adsorption and isotherms; fundamentals and applications of ion exchange
<b><i>Mid-term exam</i></b>		
Week 9		<b>Disinfection</b>
	Topics:	Chlorine and ozone and UV
Week 10		<b>Biological Wastewater Treatment</b>
	Topics:	Cell growth, factors affecting biological growth, biodegradation kinetics
Week 11		<b>Biological Wastewater Treatment</b>
	Topics:	Aerated lagoon and activated sludge processes
Week 12		<b>Biological Wastewater Treatment</b>
	Topics:	Fixed film processes
Week 13		<b>Resource recovery (if time permits)</b>
	Topics:	Sludge digestion and energy production