

## COURSE INFORMATION

Course Name: Water Quality

Course Code: CIV ENG 3L03

Session Offered: Winter 2021

Calendar Description: 3 units. Physical, chemical and biological characteristics of water; stoichiometry; thermodynamics; acid/base chemistry; carbonate system; nitrogen and phosphorous cycles; mathematical modeling of physical systems; water quality standards.

Instructor: Younggy Kim (JHE 334; [younggy@mcmaster.ca](mailto:younggy@mcmaster.ca); no Ave-to-Learn email)

Class Schedule (Location: Virtual):

Lecture: Mo 8:30-10:20am

Office hr: Mo 11:30-12:20pm

Lab: Mo 11:30am-2:20pm; Mo 2:30-5:20pm; Tu 8:30-11:20am; We 11:30am-2:20pm; Fr 2:30-5:20pm

Tutorial: Th 9:30-11:20am; Fr 9:30-11:20am

Lab instructor: Monica Han Han (JHE 201; [hanm7@mcmaster.ca](mailto:hanm7@mcmaster.ca); available by appointment)

Teaching Assistants: Abdelrahman Amer ([amera9@mcmaster.ca](mailto:amera9@mcmaster.ca)); Melina Roshanfar ([roshanfm@mcmaster.ca](mailto:roshanfm@mcmaster.ca));  
Negar Shahsavari ([shahsavn@mcmaster.ca](mailto:shahsavn@mcmaster.ca))

## 1. COURSE OBJECTIVES

At the end of the course, the students will have solid understanding of fundamentals of water chemistry and its applications as environmental engineers. The students will also practice and obtain relevant skills and techniques for determining water quality parameters.

## 2. COURSE SPECIFIC POLICIES

**Attendance:** Lecture attendance is expected but will not be reflected in grading. It is strongly recommended that the students should not miss any lectures. Instructor's written notes will not be shared while power point presentations and handouts will be posted on Avenue to Learn.

**Textbook and course materials:** There are no designated textbooks in this course. In case you are interested in water quality engineering, you can read 'Water chemistry' by Snoeyink and Jenkins. Course materials will be posted on A2L (not on MS Teams).

**Examinations:** No mid-term exams. The final exam is an open-book and open-source examination. However, exam questions can hardly be answered from the internet. Please attend lectures if you want to do well in the final exam.

**Assignments:** 3 homework assignments will be posted on A2L. Completed assignments must be submitted through A2L (no submission on MS Teams or via emails). Late assignments will be assessed a penalty of 20% per academic day in general; however, late assignments may not be accepted depending on course schedule.

**In-class quiz:** There will be an in-class quiz for each lecture (i.e., 12 quizzes). The due of each quiz is 11:55pm on the date of the lecture. Late submission will not be accepted as the submission link will be inactive at 11:55pm. In-class quiz must be completed on A2L (no submission on MS Teams or via emails). For quiz completion, go to Assessments → Assignments (not Quizzes) on A2L. Quiz questions will be released during each lecture.

**Laboratory experiments and term projects:** Each student must participate in all VIRTUAL mandatory laboratory sessions, which will provide supplemental exposure to several important concepts that are covered in this course. We will have four regular lab sessions in addition to a preliminary lab. The tentative dates for lab sessions are available on the Avenue calendar. Lab experiments will be conducted in groups of four students. All group members must participate in all labs. All group members are expected to take part in report/presentation preparation. Expected formats and structure of report/presentation will be posted on Avenue. A late penalty of

20% per academic day will be applied. All group members must read the lab handout prior to a lab session. There may be pre-lab quizzes to ensure that you have read the lab handouts and understand experimental steps and materials. Both of the lab report and quiz will be included in your term project evaluation. During the preliminary lab session, we will have a safety presentation and group assignment. Attendance at this VIRTUAL preliminary lab is also mandatory.

**Tutorials and term projects:** Detailed plans and contents on 3 term projects will be provided and discussed in tutorials while you need to obtain water quality information during the lab sessions. We will have final presentations for Project#3 in tutorials (on March 26, April 1, 8, 9). We do not have tutorials every week, but we may have both tutorials and labs in a week. The tutorial dates will be announced on Avenue.

**MSAF Policy:** When a self-reporting relief is submitted, the portion of the missed academic work will be automatically transferred to the final examination. It is your responsibility to notify the instructor of your MSAF submission. For a group assignment (including lab attendance, term project reports/presentations), MSAF will NOT be accepted.

**Laboratory Safety: The lab space can be a dangerous place if you do not follow safety rules!**

The Faculty of Engineering is committed to McMaster's University Workplace and Environmental Health and Safety Policy which states: "Students are required by University policy to comply with all University health, safety and environmental programs". It is your responsibility to understand McMaster University Workplace and Environmental Health and Safety programs and policies. For information on these programs and policies please refer to McMaster University Environmental and Health Support Services Occupational Safety Risk Management Manual at (suggested reading: Sections 10 through 16): <http://www.workingatmcmaster.ca/med/document/Lab-Safety-Handbook-1-36.pdf> (You can also find this lab safety handbook on Avenue under the Content tab of this course.)

It is also your responsibility to follow any specific Standard Operating Procedures (SOPs) provided for some of the experiments and the laboratory equipment. McMaster University's workplace health and safety guidance during COVID-19 should always be followed. The details and updates of this guidance can be found at <https://hr.mcmaster.ca/resources/covid19/workplace-health-and-safety-guidance-during-covid-19/>. To ensure laboratory safety this term in accordance with McMaster University policy related to COVID-19, all labs will be held virtually.

It is also your responsibility to follow any specific Standard Operating Procedures (SOPs) provided for some of the experiments and the laboratory equipment.

The safety requirements for JHE 220 are listed below. Students not abiding by these safety requirements will be given one warning. Second offences will result in the student being asked to vacate the laboratory, and receiving a grade of zero for that particular lab.

- Glasses or safety glasses/goggles must be worn in the lab *at all times*.
- Contact lenses are *not* to be worn in the lab.
- No short (i.e., above the knee) pants or skirts are permitted in the lab – lab coats must be worn over top of your clothing in these instances.
- Closed-toe shoes must be worn at all times.
- No loose clothing allowed.
- Long hair must be tied back.
- Gloves must be worn *at all times*.

### 3. SCHEDULE

WEEK 1: Basics of water quality and water chemistry

WEEK 2: Basics of water quality and water chemistry; Acid/base chemistry

WEEK 3: Acid/base chemistry

WEEK 4: logC-pH diagram, closed carbonate systems

WEEK 5: Henry's law, open carbonate system, alkalinity

WEEK 6: Precipitation and dissolution, turbidity

WEEK 7: Complexation for turbidity removal and chelating agents for heavy metal removal

WEEK 8: Redox chemistry: thermodynamics

WEEK 9: Thermodynamics (continued); ideal reactors; mass balance

WEEK 10: Material transport; reaction kinetics  
 WEEK 11: Gas transfer: Two film theory  
 WEEK 12: Water quality modeling  
 WEEK 13: Biological water quality parameters; phosphorus cycle; adsorption and emerging contaminants  
 FINAL EXAM: Scheduled during the regular University Final Examination period established by the Registrar's Office

4. ASSESSMENT OF LEARNING	WEIGHT %
Assignment (3 homework assignments)	24% (8% each)
In-class quiz (12 quizzes)	24% (2% each)
Tutorial report (2 group reports)	4% (2% each)
Term project report (2 group reports; Projects#1 and #2)	12% (6% each)
Term project presentation (1 group presentation; Project#3)	6% (tutorials on March 26, April 1, 8, 9)
Final examination	30%

### 5. LEARNING OUTCOMES

#### **CEAB Learning Indicators Measured in This Course**

The following Graduate Attributes (GAs) and Learning Indicators are being measured in this course. While some other GAs are also relevant to this course, they are not being measured in this course and therefore are not listed here.

#### **4. Design: The ability to identify and to address their own educational needs in a changing world, sufficiently to maintain their competence and contribute to the advancement of knowledge.**

4.4 Have experience with techniques for generation of creative ideas such as brainstorming and structured inventive thinking.

#### **6. Individual and team work: An ability to work effectively as a member and leader in teams, preferably in a multi-disciplinary setting.**

6.2 Develops and implements processes and methodologies to manage the effectiveness of a team both in terms of the quality of the work produced by the team as well as the inter-personal relationships within the team.

6.3 Works in a group, taking a leadership role as appropriate and relinquishing the leadership role as appropriate.

#### **7. Communication Skills: An ability to communicate complex engineering concepts within the profession and with society at large. Such abilities include reading, writing, speaking and listening, and the ability to comprehend and write effective reports and design documentation, and to give and effectively respond to clear instructions.**

7.2 Presents instructions and information clearly and concisely as appropriate to the audience

#### **12. Lifelong Learning: The ability to identify and to address their own educational needs in a changing world, sufficiently to maintain their competence and contribute to the advancement of knowledge.**

12.1 Critically evaluates and applies knowledge, methods and skills procured through self-directed and self-identified sources, including those that lie outside the nominal course curriculum.

12.2 Shows an awareness of the wide range of engineering societies, literature, conferences, and other information sources.

When this course is complete, the student will be able to:

- List the physical, chemical and biological characteristics of water, and demonstrate an understanding of the significance of each of these characteristics, and its associated parameters, through: (a) the development of an analytical protocol to answer specific water quality questions; and (b) the analysis of these analytical data. (4.4, 6.2, 6.3, 7.2, 12.1, 12.2)
- Understand the federal and provincial legislation relating to water quality – including treatment and source water protection - and understand which issues fall under which jurisdictions. (12.2)
- Use the principles of thermodynamics and acid-base chemistry to solve chemical equilibrium problems. (12.1)
- Apply stoichiometry, reaction kinetics, material balances and reactor theory to develop mathematical models of contaminants moving through complex environmental systems, including rivers, estuaries, lakes, reservoirs and groundwater systems. (4.4)

**Note that there are other learning outcomes in this course that are not measured. (See the list of main course topics in 3. Schedule.)**

### 6. COMMUNICATIONS

It is the student's responsibility to:

- Maintain current contact information with the University, including address, phone numbers, and emergency contact information.
- Use the University provided e-mail address or maintain a valid forwarding e-mail address.
- Regularly check the official University communications channels. Official University communications are considered received if sent by postal mail, by fax, or by e-mail to the student's designated primary e-mail account via their "@mcmaster.ca" alias.
- Accept that forwarded e-mails may be lost and that e-mail is considered received if sent via the student's @mcmaster.ca alias.
- Check the McMaster/Avenue email and course websites on a regular basis during the term.

## 7. POLICIES

### **ACADEMIC INTEGRITY**

You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity. **It is your responsibility to understand what constitutes academic dishonesty.**

Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: "Grade of F assigned for academic dishonesty"), and/or suspension or expulsion from the university. For information on the various types of academic dishonesty please refer to the [Academic Integrity Policy](https://secretariat.mcmaster.ca/university-policies-procedures-guidelines/), located at <https://secretariat.mcmaster.ca/university-policies-procedures-guidelines/>.

The following illustrates only three forms of academic dishonesty:

- plagiarism, e.g. the submission of work that is not one's own or for which other credit has been obtained.
- improper collaboration in group work.
- copying or using unauthorized aids in tests and examinations.

### **AUTHENTICITY / PLAGIARISM DETECTION**

**Some courses may** use a web-based service (Turnitin.com) to reveal authenticity and ownership of student submitted work. For courses using such software, students will be expected to submit their work electronically either directly to Turnitin.com or via an online learning platform (e.g. A2L, etc.) using plagiarism detection (a service supported by Turnitin.com) so it can be checked for academic dishonesty.

Students who do not wish their work to be submitted through the plagiarism detection software must inform the Instructor before the assignment is due. No penalty will be assigned to a student who does not submit work to the plagiarism detection software. **All submitted work is subject to normal verification that standards of academic integrity have been upheld** (e.g., on-line search, other software, etc.). For more details about McMaster's use of Turnitin.com please go to [www.mcmaster.ca/academicintegrity](http://www.mcmaster.ca/academicintegrity).

### **COURSES WITH AN ON-LINE ELEMENT**

**Some courses may** use on-line elements (e.g. e-mail, Avenue to Learn (A2L), LearnLink, web pages, capa, Moodle, ThinkingCap, etc.). Students should be aware that, when they access the electronic components of a course using these elements, private information such as first and last names, user names for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in a course that uses on-line elements will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure, please discuss this with the course instructor.

### **ONLINE PROCTORING**

**Some courses may** use online proctoring software for tests and exams. This software may require students to turn on their video camera, present identification, monitor and record their computer activities, and/or lock/restrict their browser or other applications/software during tests or exams. This software may be required to be installed before the test/exam begins.

## **CONDUCT EXPECTATIONS**

As a McMaster student, you have the right to experience, and the responsibility to demonstrate, respectful and dignified interactions within all of our living, learning and working communities. These expectations are described in the [Code of Student Rights & Responsibilities](#) (the “Code”). All students share the responsibility of maintaining a positive environment for the academic and personal growth of all McMaster community members, **whether in person or online.**

It is essential that students be mindful of their interactions online, as the Code remains in effect in virtual learning environments. The Code applies to any interactions that adversely affect, disrupt, or interfere with reasonable participation in University activities. Student disruptions or behaviours that interfere with university functions on online platforms (e.g. use of Avenue 2 Learn, WebEx or Zoom for delivery), will be taken very seriously and will be investigated. Outcomes may include restriction or removal of the involved students’ access to these platforms.

## **ACADEMIC ACCOMMODATION OF STUDENTS WITH DISABILITIES**

Students with disabilities who require academic accommodation must contact [Student Accessibility Services](#) (SAS) at 905-525-9140 ext. 28652 or [sas@mcmaster.ca](mailto:sas@mcmaster.ca) to make arrangements with a Program Coordinator. For further information, consult McMaster University’s [Academic Accommodation of Students with Disabilities](#) policy.

## **REQUESTS FOR RELIEF FOR MISSED ACADEMIC TERM WORK**

[McMaster Student Absence Form \(MSAF\)](#): In the event of an absence for medical or other reasons, students should review and follow the Academic Regulation in the Undergraduate Calendar “Requests for Relief for Missed Academic Term Work”.

The McMaster Student Absence Form is a self-reporting tool for **Undergraduate Students** to report absences that last up to 5 days and provides the ability to request accommodation for any missed academic work. Please note, this tool cannot be used during any final examination period. You may submit a maximum of 1 Academic Work Missed requests per term. It is **your** responsibility to follow up with your Instructor immediately regarding the nature of the accommodation. If you are absent more than 5 days or exceed 1 request per term you **must** visit your Associate Dean's Office (Faculty Office). You may be required to provide supporting documentation. This form should be filled out immediately when you are about to return to class after your absence.

## **ACADEMIC ACCOMMODATION FOR RELIGIOUS, INDIGENOUS OR SPIRITUAL OBSERVANCES (RISO)**

Students requiring academic accommodation based on religious, indigenous or spiritual observances should follow the procedures set out in the [RISO](#) policy. Students should submit their request to their Faculty Office **normally within 10 working days** of the beginning of term in which they anticipate a need for accommodation or to the Registrar's Office prior to their examinations. Students should also contact their instructors as soon as possible to make alternative arrangements for classes, assignments, and tests.

## **COPYRIGHT AND RECORDING**

Students are advised that lectures, demonstrations, performances, and any other course material provided by an instructor include copyright protected works. The Copyright Act and copyright law protect every original literary, dramatic, musical and artistic work, **including lectures** by University instructors.

The recording of lectures, tutorials, or other methods of instruction may occur during a course. Recording may be done by either the instructor for the purpose of authorized distribution, or by a student for the purpose of personal study. Students should be aware that their voice and/or image may be recorded by others during the class. Please speak with the instructor if this is a concern for you.

## **PROTECTION OF PRIVACY ACT (FIPPA)**

The Freedom of Information and Protection of Privacy Act (FIPPA) applies to universities. Instructors should take care to protect student names, student numbers, grades, and all other personal information at all times. For example, the submission and return of assignments and the posting of grades must be done in a manner that ensures confidentiality – see <http://www.mcmaster.ca/univsec/fippa/fippa.cfm>.

## **ANTI-DISCRIMINATION**

The Faculty of Engineering is concerned with ensuring an environment that is free of all discrimination. If there is a problem, individuals are reminded that they should contact the Department Chair, the Sexual Harassment

Officer, or the Human Rights Consultant, as soon as possible.

[https://www.mcmaster.ca/policy/General/HR/Discrimination\\_and\\_Harassment.pdf](https://www.mcmaster.ca/policy/General/HR/Discrimination_and_Harassment.pdf)

### **EXTREME CIRCUMSTANCES**

The University reserves the right to change the dates and deadlines for any or all courses in extreme circumstances (e.g., severe weather, labour disruptions, etc.). Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, A2L and/or McMaster email.

### **8. MCMASTER GRADING SCALE**

<b>Grade</b>	<b>Equivalent Grade Point</b>	<b>Equivalent Percentages</b>
A+	12	90-100
A	11	85-89
A-	10	80-84
B+	9	77-79
B	8	73-76
B-	7	70-72
C+	6	67-69
C	5	63-66
C-	4	60-62
D+	3	57-59
D	2	53-56
D-	1	50-52
F	0	0-49