

### COURSE INFORMATION

Course Name: **FLUID MECHANICS**

Course Code: CIVENG 2004

Session Offered: Winter 2021

Calendar Description: 4 unit(s) Fluid properties; hydrostatics; continuity, momentum and energy equations; potential flow; laminar and turbulent flow; flow in closed conduits, transients, open channel flow; hydraulic cross-sections. Three lectures, one tutorial or one lab; second term Prerequisite(s): Credit or registration in CIVENG 2P04; and credit or registration in MATH 2ZZ3 and MATH 2Z03

Instructor(s): Dr. Benzhong Zhao

Phone:

Email: robinzhao@mcmaster.ca

Office Hours/Contact: TBD

Class Schedule Day(s): MoWeTh Time: 5:30PM - 6:20PM

Location: Virtual

### 1. COURSE OBJECTIVES

This is an introductory course on the fundamental principles of fluid mechanics. By the end of the course, students should have a good intuition of fluid flow in simple geometries and be able to solve fluid problems mathematically using conservation of mass, momentum and energy. In addition to analytical approaches, we will introduce empirical models that are sometimes necessary to solve fluid flow in complex geometries. The goals are to develop an understanding of the basics of fluid motion and an ability to analyze flow commonly encountered in civil engineering.

### 2. COURSE SPECIFIC POLICIES

The topics in this course will be presented in a traditional lecture format via Zoom ([lecture link](#)), with emphasis on developing physical intuition and mathematical competency. Students are expected to attend and actively participate in the lectures. Tutorials will be used to review and practice key concepts presented in the lectures. Students are encouraged to actively participation in class discussions on Zoom and on the class Piazza forum ([link](#)).

### 3. SCHEDULE

WEEK 1	Introduction & Physical Properties of Fluids	
WEEK 2	Dimensional Analysis	HW1
WEEK 3	Fluid Statics	
WEEK 4	Pressure Forces on Surfaces	HW2
WEEK 5	Buoyancy and Rotational Stability	
WEEK 6	Capillarity and Wetting Phenomenon	HW3
WEEK 7	Kinematics	

WEEK 8	Control Volume & Conservation Equations	
WEEK 9	Bernoulli's Principle	HW4
WEEK 10	Open Channel Flow	
WEEK 11	Flow Control & Measurement	HW5
WEEK 12	Viscous Flow	
WEEK 13	Groundwater Flow	HW6
FINAL EXAMINATION (If no final exam please delete)	Scheduled during the regular University Final Examination period established by the Registrar's Office	
<b>4. ASSESSMENT OF LEARNING</b>		<b>WEIGHT %</b>
Homework assignments		24%
Laboratory reports		20%
Class participation		6%
Midterm exam		20%
Final exam		30%
To pass the course, students must complete and pass the exam portion of the course. Specifically, the weighted-average of the midterm and final exam grade must be above 50%.		
<b>5. LEARNING OUTCOMES</b>		
Upon completion, the student will have:		
<ul style="list-style-type: none"> <li>• the competence in the specialized engineering knowledge of fluid mechanics (Attribute 1.4)</li> <li>• the ability to identify reasonable assumptions (including identification of uncertainties and imprecise information) that could or should be made before a solution path is proposed (Attribute 2.1)</li> <li>• the ability to manage time and processes effectively, prioritizing competing demands to achieve personal and team goals and objectives (Attribute 6.1)</li> <li>• the competence to construct effective written arguments (Attribute 7.3)</li> </ul>		
<b>6. COMMUNICATIONS</b>		
It is the student's responsibility to:		
<ul style="list-style-type: none"> <li>• Maintain current contact information with the University, including address, phone numbers, and emergency contact information.</li> <li>• Use the University provided e-mail address or maintain a valid forwarding e-mail address.</li> <li>• 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.</li> </ul>		

- 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**

Grade	Equivalent Grade Point	Equivalent Percentages
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