

Civil Engineering
CIVENG 2004
Fluid Mechanics
Winter 2024



ENGINEERING

Instructor Information



Benzhong Zhao
Email: zhaob20@mcmaster.ca
Office Hours:
TBD

TA Information

Name: Nima Shakourifar
Email: shakourn@mcmaster.ca

Name: Fuwei Rao
Email: raof3@mcmaster.ca

Class Times

- Lectures: MoWeTh 5:30PM - 6:20PM
- Tutorials: Mo 12:30PM - 2:20PM (T01); Mo 10:30AM - 12:20PM (T02)
- Labs: Tu 2:30PM - 5:20PM

Class Format

In Person

The topics in this course will be presented in a traditional lecture format, 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 participate in class discussions on Avenue. In-person attendance is required for this course.

Course Dates: 01/08/2024 - 04/10/2024

Units: 4.00

Course Delivery Mode: In Person

Course Description: 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 (two hours), one lab (three hours); second term Prerequisite(s): CIVENG 2P04, MATH 2Z03; credit or registration in MATH 2ZZ3 Antirequisite(s): MECHENG 3O04

Important Links

- [Mosaic](#)
- [Avenue to Learn](#)
- [Student Accessibility Services - Accommodations](#)
- [McMaster University Library](#)
- [eReserves](#)

Course Learning Outcomes

- Develop the competence in the specialized engineering knowledge of fluid mechanics.
- Obtain 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.

- Obtain the ability to manage time and processes effectively, prioritizing competing demands to achieve personal and team goals and objectives.
- Develop the competence to construct effective written arguments.

Graduate Attributes

The Canadian Engineering Accreditation Board (CEAB) is a division of Engineers Canada and is responsible for accrediting undergraduate engineering programs across Canada. Accreditation by the CEAB ensures that the engineering programs meet a national standard of quality and cover essential educational requirements. Graduate Attributes are a set of qualities and skills that the CEAB expects engineering graduates to possess. These attributes are a benchmark for the learning outcomes of accredited engineering programs. This section lists the Graduate Attribute Indicators associated with the Learning Outcomes in this course.

- Graduate Attribute Indicator 1.3: Competence in Engineering Fundamentals. (Course Learning Outcome 1)
- Graduate Attribute Indicator 1.4: Competence in Specialized Engineering knowledge. (Course Learning Outcome 1)
- Graduate Attribute Indicator 2.1: Identifies and states reasonable assumptions and suitable engineering fundamentals, before proposing a solution path to a problem. (Course Learning Outcome 2)
- Graduate Attribute Indicator 6.1: Actively contributes to the planning and execution of a team project. (Course Learning Outcome 3)
- Graduate Attribute Indicator 7.2: Composes an effective written document for the intended audience. (Course Learning Outcome 4)
- Graduate Attribute Indicator 11.2: Plans and effectively manages a project's time, resources, and scope, following business practices as appropriate. (Course Learning Outcome 3)

Lab Information

You are required to participate in all four laboratory sessions. Each group member is expected to contribute equally to the lab report writing to receive mark.

Lab Safety

The Faculty of Engineering is committed to McMaster University's 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 Health and Safety](#). The Lab Safety Handbook is available [here](#), as well as on A2L.

It is also your responsibility to follow any specific Standard Operating Procedures (SOPs) provided for some of the experiments and the laboratory equipment. A laboratory-specific set of rules can also be added to ensure that students fully understand laboratory safety rules that are in place prior to their first session.

Course Schedule

A weekly breakdown of the course schedule

| Week | Topic | Assessment |
|---------------|--|------------|
| 1 | Introduction & Physical Properties of Fluids | |
| 2 | Dimensional Analysis | HW1 |
| 3 | Fluid Statics | |
| 4 | Pressure Forces on Surfaces | HW2 |
| 5 | Buoyancy and Rotational Stability | |
| Midterm Break | | |
| 6 | Capillarity and Wetting Phenomenon | HW3 |

| Week | Topic | Assessment |
|------|---|------------|
| 7 | Kinematics | |
| 8 | Control Volume & Conservation Equations | |
| 9 | Bernoulli's Principle | HW4 |
| 10 | Open Channel Flow | |
| 11 | Flow Control & Measurement | HW5 |
| 12 | Viscous Flow | |
| 13 | Review | HW6 |

Required Materials and Texts

Textbook Listing: <https://textbooks.mcmaster.ca>

There are no required materials and texts.

Optional Course Materials

Textbook Listing: <https://textbooks.mcmaster.ca>

Fundamentals of Fluid Mechanics

Authors: Munson, Young, and Okiishi

Publisher: Wiley

Publication Date: 2016

Edition: Eighth Edition

Course Evaluation

| | |
|----------------------|-----|
| Homework assignments | 20% |
| Laboratory reports | 20% |
| Class participation | 5% |
| Midterm exam | 25% |
| Final exam | 30% |

Course Evaluation Details

- 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%.
- Students earn participation points by contributing to the Discussion Board on Avenue to Learn and by posting original fluid-related photos and videos to the [Course Instagram](#).

Grading Scale

The McMaster 12 Point 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 |

Late Assignments

- A 25% penalty will be assessed to all late assignments.

Absences, Missed Work, Illness

- 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.
- Under normal circumstances, students submitting an MSAF will be granted a 1-week extension to the missed academic work, starting from the original listed deadline.

Generative AI: Use Prohibited

Students are not permitted to use generative AI in this course. In alignment with [McMaster academic integrity policy](#), it “shall be an offence knowingly to ... submit academic work for assessment that was purchased or acquired from another source”. This includes work created by generative AI tools. Also state in the policy is the following, “Contract Cheating is the act of “outsourcing of student work to third parties” (Lancaster & Clarke, 2016, p. 639) with or without payment.” Using Generative AI tools is a form of contract cheating. Charges of academic dishonesty will be brought forward to the Office of Academic Integrity.

APPROVED ADVISORY STATEMENTS

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-proceduresguidelines/), located at <https://secretariat.mcmaster.ca/university-policies-proceduresguidelines/>

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.

Courses with an On-line Element

Some courses may use on-line elements (e.g. e-mail, Avenue to Learn, 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.

Equity, Diversity, and Inclusion

The Faculty of Engineering is committed to creating an environment in which students of all genders, cultures, ethnicities, races, sexual orientations, abilities, and socioeconomic backgrounds have equal access to education and are welcomed and treated fairly. If you have any concerns regarding inclusion in our Faculty, in particular if you or one of your peers is experiencing harassment or discrimination, you are encouraged to contact the Chair, Associate Undergraduate Chair, Academic Advisor or to contact the [Equity and Inclusion Office](#).

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 to make arrangements with a Program Coordinator. For further information, consult McMaster University's [Academic Accommodation of Students with Disabilities](#) policy.

Academic Advising

For any academic inquires please reach out to the Office of the Associate Dean (Academic) in Engineering located in JHE-Hatch 301.

Details on academic supports and contact information are available from:

<https://www.eng.mcmaster.ca/programs/academic-advising>

Requests for Relief for Missed Academic Term Work

In the event of an absence for medical or other reasons, students should review and follow the [Policy on Requests for Relief for Missed Academic Term Work](#).

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.

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, Avenue to Learn and/or McMaster email.