



CHEMENG 4W06 (A/B)

Chemical Plant Design & Capstone Project

Course Outline

Fall 2024 – Winter 2025

I, Shelir, respectfully acknowledge that McMaster University is located on the traditional territories of the Mississauga and Haudenosaunee nations, and within the lands protected by the “Dish with One Spoon” wampum agreement. Wampum belts are beads bound onto strings which narrate Haudenosaunee history, tradition, and laws. The “Dish with One Spoon” wampum was created to bind the nations of the Haudenosaunee Confederacy to the Great Law of Peace. The “Dish” represents the shared land, while “One Spoon” reinforces the idea of sharing and peace.

To say that is to acknowledge a debt to those who were here before us and to recognize my responsibility, as a guest, to respect and honor the relationship Indigenous peoples have to this land. May we be guided by love and right action as we transform of our personal and institutional relationships with our indigenous friends and neighbors.

CHEMENG 4W06 (A/B): Chemical Plant Design & Capstone project

Prerequisite/ Corequisite:

- Being in final year of undergrad studies. Should be graduated by **December 2025**.
- CHEMENG 4N04: Already completed or be taken in Fall 2024.

CLASS INFO:

Due to the nature of the course, we won't be using the allocated lecture time every single week. But when we do, we will be in person unless it is announced ahead of time that we hold the class virtually.

Some of scheduled lecture time will be used for workshops, meetings, and any other related course activities, the announcement will be made ahead of time. You also, as a team, can use scheduled lecture time to work on your project.

All outside class communications with the course coordinator and TA should be done via **E-mail**.

Since lots of stakeholders are involved in this course, please be advised that some contents and policies may be modified as we go through the course, especially the pieces related to the final deliverables. I, Shelir, make sure to communicate any changes ahead of time with students and provide clarifications and reasoning behind any changes. It is the responsibility of the students to check Avenue to Learn daily during the term and to note any changes.

We also consider this classroom to be a place where you will be treated with respect, and we welcome individuals of all ages, backgrounds, beliefs, ethnicities, genders, gender identities, gender expressions, national origins, religious affiliations, sexual orientations, ability, and other visible and non-visible differences. All members of this class are expected to contribute to a respectful, welcoming, and inclusive environment for every other member of the class. We will gladly honor your request to address you by an alternate name or gender pronoun. Please advise us of this preference early in the semester so that we may make appropriate changes to our records.

I also, have a goal to create a safe environment, where you should feel comfortable bringing forward or discussing any concerns, issues or suggestions regarding the delivery or inclusivity of this course. Do not hesitate to reach out to me; I want to make your learning experience as positive as possible.

COURSE DESCRIPTION:

ChemEng 4W06 is a capstone design project in response to an actual engineering problem. The project can be multidisciplinary or in a specialized area of chemical engineering. ChemEng 4W06 is a two-term (six-credit) course during which students work as a team to prepare detailed design documents in response to a project introduced by an industry partner as the main client. The course is overseen by a course coordinator (Dr. Shelir Ebrahimi). The students work as a team under the guidance and supervision of a faculty advisor with partnership of an industrial team. The course is a self-directed study and students can consult with any professor and use all resources at their disposal. A Resource Guideline document will be shared with students to support their project work.

The course is designed to allow students to use knowledge gained from engineering courses taken throughout their program, including those in design and engineering communication, to successfully conduct **self-guided engineering design** for a specific project of their choice. The course is designed to have students work in teams emulating real-world engineering practice whereby the students must deal with **time management and team dynamics**. Fully defining the nature and scope of the research project, in a format of a project proposal and interim report, are important components of Term 1 and preparation of a professional quality design report, project deliverables, and final presentations of the project are main deliverables for Term 2. The ability to complete the work in a professional manner,

including communications with faculty, team members, and industry, is also an important component of the course.

INTENDED LEARNING OUTCOMES AND CEAB INDICATORS

Based on the Learning Outcomes (LOs) of the course, by the end of this course, the students should be able to:

1. Recognize and follow engineering design principles. Apply specialized engineering-based knowledge to identify, formulate, analyze, and solve an open-ended Chemical Engineering challenge introduced by industry client.
2. Recognize and discuss applicable theory knowledge base.
3. Select and apply appropriate analytical techniques, resources, and modern engineering tools to the solution of open-ended problems with an understanding of their associated limitations.
4. Identify reasonable assumptions (including identification of uncertainties and imprecise information) that could or should be made before a solution path is proposed.
5. Apply sustainability principles (people-planet-profit) in the project decision making process.
6. Assess possible options and design configurations from a sustainability engineering perspective, which emphasizes environmental stewardship, life-cycle analysis, and long-term decision-making principles.
7. Apply detailed economic analyses to evaluate the viability of an engineering solution.
8. Identify, characterize, assess, and manage risks to project success. Understands the business processes for implementing engineering ideas.
9. Develop and implement 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.
10. Effectively and efficiently communicate, both orally and in written forms, complex engineering concepts.
11. Reflect on their own experience of learning.

In addition to the above learning outcomes, it is expected that students will also be exposed to:

12. Conducting literature reviews and developing the appropriate referencing skills for their engineering reports, be aware of the wide range of engineering societies, literature, conferences, and other information sources.
13. Professional societies and codes of practice, including professional engineering ethics, the responsibility to and the role of engineers in society.

The following CEAB (Canadian Engineering Accreditation Board) indicators will be addressed within CHEMENG 4W06. The learning outcomes are mapped with indicators and specific deliverables of the course will be used to evaluate students for each LO as well as indicator.

CEAB Indicator	Learning Outcomes
4.1 Defines the problem by identifying relevant context, constraints, and prior approaches before exploring potential design solutions.	LO1, LO2, LO3, LO4
4.4 Justifies and reflects on design decisions, giving consideration to limitations, assumptions, constraints and other relevant factors.	LO1, LO2, LO3, LO4
6.1 Actively contributes to the planning and execution of a team project.	LO9
7.2 Composes an effective written document for the intended audience.	LO10

CEAB Indicator	Learning Outcomes
7.3 Composes and delivers an effective oral presentation for the intended audience.	LO10
8.2 Integrates appropriate standards, codes, legal and regulatory factors into decision making.	LO4, LO13
9.1 Evaluates the environmental impact of engineering activities, identifies uncertainties in decisions, and promotes sustainable design.	LO5, LO6
9.2 Evaluates the social impact of engineering activities, including health, safety, legal, cultural, and other relevant factors, and identifies uncertainties in decisions.	LO6, LO7
11.3 Identifies, characterizes, assesses, and manages risks to project success.	LO8
12.1 Critically assesses one's own educational needs and opportunities for growth.	LO11, LO12, LO13

COURSE WEBSITE

CHEMENG 4W06 (A/B) will use an Avenue to Learn (A2L) site which students can access via their MacID and password. The course A2L site is an important means of communication between the teaching team and the class and should be consulted regularly. Course announcements (including important due dates), lecture schedules, notes and other important course information will be posted on the CHEMENG 4W06 course shell on A2L. **Students are solely responsible for keeping up to date with all course announcements, instructional materials, and due dates.** Students should inform the course coordinator if they encounter problems with the course A2L site.

IMPORTANT DATES

Item	Deadline
Term 1	
Group Formation & Project Ballot Submission	September 15 th , 2024
Project & Group Assignments by Dr. Ebrahimi	September 20 th , 2024
Group enrolment on Avenue	September 27 th , 2024
Self-Reflection #1	September 27 th , 2024
First Draft of the Team Charter & Proposal	October 4 th , 2024
First Meeting to be scheduled between students' team, faculty mentor, industry partner(s), and course coordinator (responsibility of students)	Date of meeting should be confirmed by October 4 th and meeting should happen BEFORE or on October 11 th at the latest.
Final Team Charter & Proposal & NDA/IP Agreements	October 25 th , 2024
Fall-Semester Pitch Presentation	Week of November 4 th - Class time
Progress Report 1	Nov 10 th , 2024
Progress Report 2	December 1 st , 2024
Interim Report	December 20 th , 2024
Peer-Evaluation #1	December 22 nd , 2024
Term 2	
Progress Report #3	January 26 th , 2025

Item	Deadline
Progress Repro #4	February 23 rd , 2025
Progress Report #5	March 23 rd , 2025
Final Project Video, Poster, & Info (Expo Day)	March 30 th , 2025
Mac. Eng Capstone Expo Day TBA	Week of April 7 th
Final Presentation (if needed by Industry Partner)	Flexible based on the availability of the industry partner
Final Project Submissions (Final report, project supplementary documents, logbook, portfolio)	April 11 th , 2025
Self-Reflection #2 & Peer-Evaluation #2	April 13 th , 2025

Note:

- Unless otherwise noted, all deliverables of the course are due by 11:59pm (EST) on the designated due date and must be submitted to the appropriate A2L assignment Dropbox.
- All coursework must be submitted on time or deductions will be made without valid and documented reasons. All late penalties will be assessed by the course coordinator; A deduction of 10% per day to a minimum of zero credit will be applied to all deliverables.
- For all deliverables, there will be penalties on wrong naming conventions, wrong or missing files, as well as exceeding page limits (if applicable).

EVALUATION CRITERIA & GRADING:

aComponent	Value	Team or Individual
Project Ballot	P/F	Individual/Team
Group registration on Avenue	P/F	Individual
Team charter & project proposal	10%	Team
Fall Pitch presentation (attending and presenting)	5%	Team
Progress reports (2% each)	10%	Team
Interim report	10%	Team
Final project documents (Final report & any other supporting materials & Logbook)	25%	Team
Final Expo documents (Project video, Project info, and Poster)	5%	Team
Capstone Expo Day participation (details will be announced)	5%	Individual
Professionalism and contributions – evaluated by all stakeholders of the project	20%	Individual
Self- reflections	5%	Individual
Peer-Evaluations	5%	Individual

Notes:

- Unless otherwise noted, Pass/Fail items are subjected to penalty; 5% deduction of the total grade for each item.

- Any submission with wrong convention name or file format will lose 10% (each) of the deliverables' mark.
- Any submission to wrong Dropbox folder will lose 10% of the deliverables mark.
- Project proposal should be approved by the course coordinator to make sure it fulfills the CEAB graduate attributes.
- **In assessing the performance of each group, Dr. Ebrahimi and the project mentors (both faculty and industry) will be looking not just at the project team's success in completing the project deliverables but also at their ability to work effectively as a team.**
- All coursework will be marked on technical content and quality of analysis, organization, spelling, grammar and clarity of language.
- In the rare case that a student receives a failing grade on the professionalism portion of the grading rubric, the coordinators may adjust a student's overall individual mark allocated to professionalism, potentially resulting in a failing grade in the course. It is expected that students will use their Peer evaluations and weekly meetings to ensure that each member of the team is contributing effectively, and that they share appropriate and useful feedback to help each other develop their ability to lead and contribute to a team.
- All queries or appeals of marks received on course work should be directed to Dr. Ebrahimi no later than **one week** after releasing the grades.
- **Use of Generative AI:** Students may use generative AI for editing/ translating/ outlining/ brainstorming/ revising] their work throughout the course so long as the use of generative AI is referenced and cited following citation instructions given in the syllabus. Use of generative AI outside the stated use of [editing/translating/outlining/brainstorming/revising] without citation will constitute academic dishonesty. It is the student's responsibility to be clear on the limitations for use and to be clear on the expectations for citation and reference and to do so appropriately.
- It is always students' responsibility to verify the sources of information that they are using. There will be one lecture to discuss information literacy by a McMaster librarian.

PROJECT INFORMATION

Project Team

Project teams will normally comprise five (5) students who will form their own project team. Project teams of four (4) students will be allowed under some circumstances after discussion with, and permission from, the course coordinator (Dr. Ebrahimi). Students who cannot find a project team will be assigned a team by the course coordinator, but since this is a self-directed course, it is highly recommended to form your own team.

Each five-person team will assign specific roles to each member as follows:

- **Team Lead** – Responsible for the general organization and management of the project and will be the primary point of contact between the project team and course coordinator. This will also be the person who will be contacted by the Faculty of Engineering in preparation for the final showcase of the projects.
- **Communications Lead** – Responsible for ensuring the team communicates its progress effectively, both internally and externally to the team. This person will oversee communications with the faculty of engineering, regarding the Capstone Expo Day.

- Design and Simulation Lead – Responsible for details of design aspects of the project and any type of process simulation and PFD and P&ID creation as part of the project deliverable.
- Business and Sustainability Lead – ensuring that the team addresses the economic, social, and environmental impacts and practical application of its work. You can consider two members of the team to take responsibility for this role.
- Safety Lead (if needed)– Responsible for ensuring that all team members are working in a safe and secure manner, including the provision/performance of appropriate training and PPE. This is an important role for those projects that may include lab work.

The assignment of team members to each role should be included in both the Team Charter and the Project Proposal Document.

Important Note: Students should note that the assignment of these roles does NOT mean that other members of the team have no responsibilities in these areas. All team members should be involved in and contribute significantly to all the project activities. However, the assigned lead should exercise leadership in their assigned area and ensure that all team members are aware of the need to address the specific needs of each area.

It should be further noted that we have not asked you to assign a technical lead as it is assumed that all team members will contribute equally to the technical content of the project. However, it is a good practice to have each member of the team as an area expert so they can monitor the group activities related to that specific area of expertise (the areas of expertise should be defined based on the scope(s) of the project).

Project Selection

Project descriptions will be posted on the CHEMENG 4W06 A2L website. Student teams will be provided a ballot on A2L to indicate their first, second and third project preference choices, which will be due to the appropriate A2L Dropbox on the assigned due date. Students will also submit a max two-page letter of interest summarizing their ideas concerning project choices, which may be used to decide on final project allocations at the discretion of the course coordinator. Students who cannot find a project team should submit the ballot individually.

Students should be aware that, if a particular project is in high demand, they may not be assigned to their first project preference. In such cases, project assignments will be made at the discretion of the course coordinator on the basis of their submitted first choice ideas document and their desired second or third project preferences. Also, the priority of project assignments will be given to ballots that are submitted by full team of students.

Students are also encouraged to develop their own projects for CHEMENG 4W06 with collaboration of their own industry contact. Potential projects should be submitted for discussion and approval by Dr. Ebrahimi before the start of the semester (**August 25th 2024, at the latest**). Those groups of students who have submitted their project description before the semester starts, and the description has been approved by the course coordinator, can NOT submit a project ballot and switch to a new project. They are committed to working with the industry partner that they have defined in their project description. If for any reason they decide not to do that, it is fully their responsibility to create a new project.

Students are required to cover expenses related to preparation of their design projects. However, on case-by-case discussion, the Department of Chemical Engineering may support capstone projects financially. In this case, the group should submit a financial support request document to the course coordinator to justify the required expenses to complete the capstone project.

Use of Laboratory Facilities (if needed as part of a project)

It is required of each CHEMENG 4W06 student that they conform to the safety regulations and any training requirements associated with their use of laboratory facilities either internal or external to McMaster University. Violations of laboratory safety or training protocols will not be tolerated and can result in students being excluded from the use of identified laboratory facilities, along with an accompanying academic penalty.

Project Showcase

One of the important components of this course is showcasing the outcomes of your project while networking with other students, industry partners, and faculty members. The Faculty of Engineering holds the annual capstone Expo Day in April 2024, during the last week of classes. More details about the submissions and how to participate in the event will be communicated to students closer to the date.

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.

Authenticity / Plagiarism

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. Avenue to Learn, 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.

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.

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.

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.

The P.R.O.C.E.S.S.

As some of you may already be aware, the department of Chemical Engineering has a storied history of education. In addition to teaching and learning, the department is proud of our graduates not only for their academic success, but their more intrinsic traits that make them respected members of the engineering community.

Recently, several high-ranking graduates from the McMaster Chemical Engineering Program employed in various industries were interviewed to ask what traits they look for when hiring for engineering positions. Using this information, the department would like to present to you the **PROCESS**: a code of conduct that we hope will guide our students throughout this program and their careers to come.

- Professionalism
- Responsibility
- Ownership
- Curiosity
- Empathy
- Selflessness
- Service

It is up to YOU to interpret these traits and apply them to your time at McMaster and your career as you see fit. These traits will not be assessed for grades but will be strongly encouraged throughout your time at McMaster. We hope that you identify with these character traits and what they mean to you, and that you **trust the process**.