

3M04 Syllabus

This is a course in two parts that covers fundamental material directly relevant to your future career as a chemical engineer.

Part 1 covers the fundamentals of how individual molecules move (i.e. how mass is transferred from one place to another). This is a detailed study of diffusion. The course covers steady state diffusion in 1D, in varying geometries and in realistic engineering devices, explores the chemistry and physics associated with diffusion coefficients and mass transfer coefficients, unsteady-state diffusion, and applications to reactions and catalysis.

Part 2 covers the first introduction to separation processes by applying the fundamental diffusion theory developed in part 1. Using diffusion coefficients and mass transfer coefficients, the course explores absorption, differential contacting, and distillation processes, expanding these simple single separation processes (single stage) into multiple sequential separations processes (multiple stage-wise operations).

Instructor:

Prof. Charles-François de Lannoy (Dr. d)

Associate Professor of Chemical Engineering

Adjunct Professor of Chemistry

Lectures:

This course is a flipped-classroom style course.

I have pre-recorded and posted all the lectures on A2L. *Please watch these before you come to class.* The in-class portion is where I will review the fundamental theory and related applications, solve problems, and answer clarifying questions about the theory and practice.

Mandatory Textbook:

Transport Processes and Separation Process Principles

by C. J. Geankoplis

5th edition

Ch. 18, 19, 20, 22, 26

You can purchase the text here:

https://campusstore.mcmaster.ca/cgi-mcm/ws/txsub.pl?wsTERMG1=204&wsDEPTG1=CHEMENG&wsCOURSEG1=3M04&wsSECTIONG1=DAY%20C01&crit_cnt=1

Grading:

11 Assignments = **10%**

Consultant Report 1 = **20%**

- mid-way report 2%
- final report 18%
- Group evaluations impact 50% of project grade

Test (mass transfer) = **5%**

Midterm Exam (mass transfer) = **25%** - **you must pass Midterm to pass the course**

Consultant Report 2 = **15%**

- Group evaluations impact 50% of project grade

Final Exam (stagewise operations) = **25%** - **you must pass Final to pass the course**

Quizzes – if 70% of the quizzes are completed correctly, receive 1% on final grade

You must pass both the *midterm* exam and the *final* exam in order to pass the course

Assignment Grading Scheme:

Each question will be graded as follows:

1 mark: Complete and neatly done. All or the majority of each part of the questions have been completed in a logical manner.

0 marks: Incomplete or the solution is illegible.

Test and Exam Grading Scheme:

Each non-multiple-choice question can receive partial credit for attempted solutions. Show your work, otherwise you will not receive any credit.

Consulting Report Grading Scheme:

Each sub-part of the report will be evaluated for its thoroughness, creativity, and accuracy. Good responses that accurately assess the problem and provide accurate solutions will receive ~85%. Going beyond the basic solution will provide added marks up to 100%. These include developing creative solutions that reach beyond the basic stipulations of the question, solving the problem in multiple ways, and/or performing meta-analyses of the validity of assumptions or estimations.

MSAF policy:

- **You cannot use an MSAF the test, midterm, or the final exam**
- **You cannot use an MSAF to avoid doing the Consultant Reports**

Generative AI Policy

Students may use generative AI for editing/brainstorming/revising their work throughout the course so long as the use of generative AI is properly referenced and cited in your bibliography (of either your assignments or your consulting reports). Citations should follow the following approach:

1. **Generative AI Used**, *question asked [in italics]*, response given [normal font], asked on 'date' [normal font]

For example:

1. **ChatGPT3 free version**, *is the diffusivity of oxygen higher in toluene or in methanol*,

The diffusivity of oxygen is typically higher in gases compared to liquids. However, if we compare the diffusivity of oxygen specifically in toluene and methanol, it is generally higher in toluene.

Toluene is a nonpolar solvent with a lower viscosity compared to methanol, which is a polar solvent. The nonpolar nature of toluene allows for faster diffusion of oxygen molecules through its structure. Methanol, being a polar solvent, has stronger intermolecular interactions that can hinder the movement of oxygen molecules, resulting in a lower diffusivity compared to toluene.

It's important to note that the specific temperature and pressure conditions can also affect the diffusivity of oxygen in these liquids. Additionally, the presence of impurities or other factors can influence diffusivity as well.

asked on 2023-06-06

Use of generative AI outside the stated use of editing/brainstorming/revising without citation will constitute academic dishonesty. It is the student's responsibility to be clear about when AI was used, how it was used, and to reference appropriately.

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 (oil/gas, financials, etc.) 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**.

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.