3M04 Syllabus – Fall 2020

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 the 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)

Lectures:
Location: MS Teams – Mass Transfer and Stagewise Operations
Tuesday 12:30 pm – 1:20 pm
Wednesday 12:30 pm – 1:20 pm
Friday 12:30 pm – 1:20 pm
Lectures will be pre-recorded and posted ahead of these lecture times. The lecture times are for students to ask clarifying questions about the theory and practice of the course.

Tutorials:
Location: MS Teams – Mass Transfer and Stagewise Operations
Thursday 12:30 am – 1:20 am, Austin Bedrosian
Friday 8:30 am – 9:20 am, Nan Zhang and Claudia Alonso Cantu
Each tutorial will cover different questions and different topics. Students are strongly advised to attend **all** tutorials.

Office Hours:
Location: MS Teams – Mass Transfer and Stagewise Operations
Charles de Lannoy, Monday 12:30 pm – 1:20 pm, Tuesday 1:30 pm – 2:20 pm, Thursday 12:30 pm – 1:20 pm
Monday 1:30 pm – 2:20 pm, Nan Zhang
Wednesday 3:30 pm – 4:20 pm, Austin Bedrosian
Friday 9:30 am – 10:20 pm, Claudia Alonso Cantu

Mandatory Text Book:
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 = **15%**
Quizzes = **15%**
Consultant Report 1a (written) = **7.5%**
- Group evaluations impact 50% of project grade

Consultant Report 1b (written) = **7.5%**
- Group evaluations impact 50% of project grade

Midterm Exam = **20%**
Consultant Report 2 (written) = **15%**
- Group evaluations impact 50% of project grade

Final Exam = **20%**

Assignment Schedule (all assignments and projects handed in to drop box before 11:59 pm):

Sept. 16 – Assignment 1 Due (11:59 pm)
Sept. 23 – Assignment 2 Due (11:59 pm)
Sept. 30 – Assignment 3 Due (11:59 pm)

Oct. 2 – Consultant Report 1a Due (11:59 pm)
Oct. 7 – Assignment 4 Due (11:59 pm)
Oct. 21 – Assignment 5 Due (11:59 pm)
Oct. 28 – Assignment 6 Due (11:59 pm)
Oct. 29 – Consultant Report 1b Due (11:59 pm)

Nov. 11 – Assignment 7 Due (11:59 pm)
Nov. 18 – Assignment 8 Due (11:59 pm)
Nov. 25 – Assignment 9 Due (11:59 pm)

Dec. 2 – Assignment 10 Due (11:59 pm)
Dec. 3 – Consultant Report 2 Due (11:59 pm)
Dec. 9 – Assignment 11 Due (11:59 pm)

Tutorial Schedule:
The following example problems will be solved and concepts reviewed

Tutorial Schedule:

1. Sept. 10th – 18.1-1, 19.1-2 (6.1-1, 6.2-2) (lead by Charles, with Austin, Nan, and Claudia to attend/observe)
2. Sept 11th – 19.1-6, 19.1-9 (6.2-6, 6.2-9)
3. Sept 17th – 19.2-5 (6.3-5), Project 1a estimation examples and questions part 1 (Charles)
4. Sept 18th – 18.2-8, 19.3-1 (6.4-2, 6.5-1)
5. Sept 24th – 19.3-4 (6.5-4), Project 1a estimation examples and questions part 2 (Charles)
6. Sept 25th – 19.4-1 (7.6-1), time permitting 19.3-6 (6.5-6)
7. Oct. 1st – 20.1-2 (7.1-2), 20.1-3 (7.1-3)
8. Oct. 2nd – Concept review of unsteady state mass transfer
9. Oct. 8th – 21.1-2, 21.3-1 (7.2-2, 7.3-1),
10. Oct. 9th – 21.3-6, 21.4-1 (7.3-6, 7.4-1), Project 1b estimation examples and questions (Charles)
11. Oct. 22nd – 19.1-16, 19.1-18 (7.5-6, 7.5-8)
12. Oct. 23rd – Project 1b final questions (Charles)
13. Oct. 29th – 22.1-1 (10.2-1), Equilibrium stages intro
14. Oct. 30th – Midterm Concept Review, open questions
15. Nov. 5th – 22.1-6, (10.3-3,), Midterm take-up
16. Nov. 6th –26.1-1 (11.1-1), Project 2 structure, estimation and questions part 1 (Charles)
17. Nov. 12th – VLE example, 26.3-3 (11.3-3)
18. Nov. 13th – 26.3-4 (11.3-4)
19. Nov. 19th –26.4-1 (11.4-1)
20. Nov. 20th – 26.4-4 (11.4-4) Project 2 structure, estimation and questions part 2
21. Nov. 26th – 26.6-1 (11.5-3)
22. Dec. 3rd – MT coeff example from text or 22.1-8
23. Dec. 4th – Final Exam Concept Review
24. Dec 9th - Final Review during lecture - open questions

Exam Schedule:
Midterm Exam (Exam 1): 6 am Saturday October 31st – 6 pm Sunday November 1st, 36 hrs

Final Exam (Exam 2): TBD

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.

- **P**rofessionalism
- **R**esponsibility
- **O**wnership
- **C**uriosity
- **E**mpathy
- **S**elflessness
- **S**ervice

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**.