

University of Guelph
School of Engineering
ENGG3470: Mass Transfer Operations
Winter, 2012

1. INSTRUCTOR: Sheng Chang

Office: THRN Room 219, **Extension:** 56619,

Email: schang01@uoguelph.ca

Office hrs: Monday: 2:45 PM -4:00 PM or by appointment.

2 Lab instructors:

Joanne Ryks: Room 1199, extension: 54087, email: jryks@uoguelph.ca

Ryan Smith: Room 3403, extension: 53278, email: rsmith17@uoguelph.ca

3. TEACHING ASSISTANTS:

David Hufnagel: dhufnage@uoguelph.ca;

Darius Mali: dmali@uoguelph.ca

4. TEXT BOOK/ RECOMMENDED READINGS:

Christie John Geankoplis, Transport processes and separation process principles, 2009 (Fourth Edition), Prentice Hall, Professional Technical Reference, Upper Saddle River, ISBN 0-13-101367-X

5. PREREQUISITES: ENGG*2230, ENGG*3260, MATH*2270

CO-REQUISITE (S): ENGG*3430

Note: if you do not meet these requirements, see the instructor immediately

5. SCHEDULE:

Lectures: MINS Room300

Monday, Wednesday, Friday: 1:30 PM - 2:20 PM

Labs:

01011 & 01012: Tues, 03:30PM - 05:20PM, SCIE, Room 2101

01021 & 01022: Wed, 03:30PM - 05:20PM, SCIE, Room 2101

01031 & 01032: Thur., 03:30PM - 05:20PM, SCIE, Room 2101

01041 & 01042: Fri., 03:30PM - 05:20PM, SCIE, Room 2101

Tutorials:

01011, 01021, 01031, & 01041: Thursday: 01:30 PM - 02:20 PM, MACK 238

01012, 01022, 01032, & 01042: Thursday: 02:30 PM - 03:20 PM, MACK 233

The Tutorials will start from the week of January 16

Midterm and final exam

Midterm will be conducted during the week of Feb 13, 2011 (Day and location: TBD)

Final EXAM: Tues, 08:30PM - 10:30 PM, April 18, 2011, location (TBD)

6. COURSE CONTENTS

This course introduces students with the basic theories of the mass transfer and the engineering design principles of typical mass transfer operations. The basic mass transfer theories will focus on the molecular diffusion principles, Fick's law and one-dimension steady-state diffusion, inter-phase mass transfer theory, and applications of mass transfer theories in natural and engineered systems. The mass transfer operations will focus on the absorption/stripping, adsorption, and the membrane filtration processes with focuses on the basic process principles, main process equipment, and process design and calculation principles.

Tutorial & assignments: The main purposes of the tutorial and assignment are to help students to enhance their understanding of the lecture materials through additional examples; answering questions, group discussion, and conducting labs. The main tutorial topics and review problems will be given to the students on a weekly basis before the scheduled tutorials. All students are strongly encouraged to complete the given problems individually or in groups.

Course design project: The students are required to work in group to complete a course project on absorption/stripping/adsorption tower design. The main tasks include develop an excel process design calculation sheet based on the basic design theories, complete the process design and calculations, and write a design report.

Labs: Two laboratory assignments are required to complement the lecture materials. Students are required to attend the labs, conduct experiments, analyze the results, and write a report. The specific requirements will be outlined in advance of each lab.

Safety in the laboratory is a prime concern. University policy forbids working alone in a lab; this will be strictly enforced.

Topics outline

Part I: Basic principles of mass transfer

- Diffusion and Fick's law
- Convective mass transfer
- Film theory and inter-phase mass transfer

Part II: Applications of mass transfer theories

Adsorption/stripping operation

- Introduction
- Gas-liquid phase equilibrium
- Gas-liquid Mass transfer
- Adsorption and stripping operation
- Adsorption/stripping equipment: packed tower
- Tower design calculation
- Applications of absorption and stripping

Adsorption

- Introduction
- Adsorption isotherm
- Mass transfer in fixed beds
- Granular bed adsorption operation
- Powder activated carbon adsorption
- Applications of adsorption processes

Membrane processes

- Introductions
- Filtration with UF/MF membranes
- RO/NF processes
- Other Membrane Processes

7. GRADE EVALUATION:

Evaluation:	Value
Midterm (1)	25 %
Course design assignment (1)	15 %
Labs (2)	20 % total
Final Exam	40 %

Note: You are allowed to bring the course reader, lecture notes, and non-communicating calculator for the quiz, midterm, and final exam.

8. IMPORTANT NOTES

Student responsibilities

- Attend lectures, tutorial, and group meeting in order to obtain all the course materials that you are responsible for.
- Submit lab reports on time.
- Submission of reports for re-marking must be done within a week of being returned.
- Communications regarding this course will frequently involve the course web page and email. Students are responsible for checking the course website and the university email account for all instructions and announcements.

Late assignment/project report policy:

- Generally, when you find yourself unable to meet a course requirement such as the lab, lab report, or a test as a result of compassionate, illness or physiological reasons, a formal explanation must be made in writing to the instructor and (where possible) proper documentation must be provided. This should be done prior to an exam or assignment (if possible) or as soon as possible but definitely within a week after the exam or assignment due date.
- If no explanations are provided, exams receive a grade of zero and project reports are subject to the following deductions:
 - 25% will be deducted if the assignment is up to 24 hours late,

- 50% will be deducted if the assignment is 24 to 48 hours late,
- No assignments will be accepted after that.

University policy on academic misconduct:

Academic misconduct, such as plagiarism, is a serious offence at the University of Guelph. Please consult the Undergraduate Calendar 2008-2009 and School of Engineering programs guide, for offences, penalties and procedures relating to academic misconduct.

<http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml>

Disclaimer:

The instructor reserves the right to change any or all of the above in the event of appropriate circumstances, subject to the University of Guelph Academic Regulations