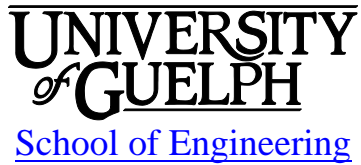


ENGG*3470 Mass Transfer Operations

Winter 2015



(Revision 0: January 1, 2015)

1 INSTRUCTIONAL SUPPORT

1.1 Instructor

Instructor: Sheng Chang, Ph.D., P.Eng.
Office: THRN 2519, ext. 56619
Email: schang01@uoguelph.ca
Office hours: 11:00 to 12:00 pm, Friday

1.2 Lab Technician

Technician: Joanne Ryks
Office: THRN 114, ext. 54087
Email: jryks@uoguelph.ca

Technician: Ryan Smith
Office: THRN 114, ext. 53873
Email: rsmith17@uoguelph.ca

1.3 Teaching Assistants

GTA	Email	Office Hours
Bei Wang	bwang02@uoguelph.ca	TBA on Courselink
Yifei Wang	ywang39@uoguelph.ca	TBA on Courselink

2 LEARNING RESOURCES

2.1 Course Website

Course material, news, announcements, and grades will be regularly posted to the ENGG*3470 Courselink site. You are responsible for checking the site regularly.

2.2 Required Resources

1. ENGG 3470 course lecture notes, posted on the courselink web page

2.3 Recommended Resources

1. Jaime Benítez, *Principles and Modern Applications of Mass Transfer Operations*, 2nd Edition, Wiley, 2009.

2.4 Additional Resources

Lecture Information: All the lecture notes are posted on the ENGG 3470 courselink web page.

Lab Information: The lab instructions and the MSDS of chemicals will be posted on the ENGG 3470 courselink web page.

Project Information: Design project instructions will be posted on the ENGG 3470 courselink web page

Assignments: Assignment and practice questions are given with the Lecture notes.

2.5 Communication & Email Policy

Please use lectures and lab help sessions as your main opportunity to ask questions about the course. Major announcements will be posted to the course website. It is your responsibility to check the course website regularly. As per university regulations, all students are required to check their <uoguelph.ca> email account regularly: e-mail is the official route of communication between the University and its student.

3 ASSESSMENT

3.1 Dates and Distribution

Labs: 20%

Lab 1 (10%): Jan 28-Feb 5; THRN 1104

Lab 2 (10%): Feb 25– March 6; THRN 1116A

Note: Both paper and electronic copies of the lab report are to be submitted. Hard copy is required to be submitted in class and Electronic copies named by team member s' last names, should be submitted through the courselink dropbox

See section 5.3 below for due dates

Project: 10%

Submission 1: Friday, March 27, Hard copy is required to be submitted in class and electronic copies through Courselink drop box

Note: Both paper and electronic copies are to be submitted, Electronic copies named by team member s' last names, should be submitted through the courselink dropbox

Quizzes: 10%: ten quizzes will be given during the lecture time once a week through the iClick system. Top five grades of each student will be accounted for the quiz grade.

Midterm: 25%

Feb 8 week, Date and Room to be finalized in the first week

Final Exam: 35%

11:30AM - 1:30PM (2015/04/08), Room TBA to be shown on Webadvisor

3.2 Course Grading Policies

Note: Missed Assessments: If you are unable to meet an in-course requirement due to medical, psychological, or compassionate reasons, please email the course instructor. See the undergraduate calendar for information on regulations and procedures for Academic Consideration:
<http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml>

Note: Accommodation of Religious Obligations: If you are unable to meet an in-course requirement due to religious obligations, please email the course instructor within two weeks of the start of the semester to make alternate arrangements. See the undergraduate calendar for information on regulations and procedures for Academic Accommodation of Religious Obligations:
<http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-accomrelig.shtml>

Passing grade: The passing grade is 50%.

Note: Missed midterm tests: If you miss a test due to grounds for granting academic consideration or religious accommodation, the weight of the missed test will be added to the final exam. There will be no makeup midterm tests.

Note: Lab Work: You must attend and complete all laboratories. If you miss a laboratory due to grounds for granting academic consideration or religious accommodation, arrangements must be made with the Lab technician to complete a makeup lab.

Note: Late Lab Reports: Late submissions of lab reports will not be accepted.

4 AIMS, OBJECTIVES & GRADUATE ATTRIBUTES

4.1 Calendar Description

Application of mass transfer principles in natural and engineered systems. Mass transport in the multi-media fate of contaminants in and between air, water and land. Design and analysis of separation processes for emission and pollutant prevention.

Prerequisite(s): ENGG*2230, ENGG*3260, MATH*2270

Co-requisite(s): ENGG*3430

4.2 Course Aims

This course introduces students with basic theories of the mass transfer and operations. The main goals of this course are (1) to teach students the basic approaches to solving environmental engineering related mass transfer problems; and (2) to introduce the methods for process analysis and design of the mass transfer operations.

4.3 Learning Objectives

At the successful completion of this course, the students will have demonstrated the ability to:

1. Apply mass transfer theory to analyze interface mass transfer mechanisms and solve one dimension steady state mass transfer problems;
2. Utilize knowledge of adsorption to analyze the adsorption equilibrium and breakthrough behavior, and design fixed bed adsorption column for water or air purification;
3. Integrate knowledge of the mass balance, mass transfer, and process operation constrains to design absorption/stripping packed beds for environmental pollution control;
4. Apply membrane filtration principles to analyze factors affecting membrane filtration and design membrane filtration process for water purification;
5. Integrate air-water mass transfer equations and box models to solve environmental mass transfer problems.

4.4 Graduate Attributes

Successfully completing this course will contribute to the following CEAB Graduate Attributes:

Graduate Attribute	Learning Objectives	Assessment
1. Knowledge Base for Engineering	1, 2, 3, 4, 5	Assignment , Exams
2. Problem Analysis	1, 2, 3, 4, 5	Assignment, Exams, Project

3. Investigation	1, 2, 3, 4, 5	Labs, Assignment
4. Design	2, 3, 4, 5	Project
5. Use of Engineering Tools	2, 3	Labs, Project
6. Communication	1,2, 3	Labs, Project
7. Individual and Teamwork	-	-
8. Professionalism	-	-
9. Impact of Engineering on Society and the Environment	1, 2, 3, 4, 5	Project
10. Ethics and Equity	-	-
11. Environment, Society, Business, & Project Management	-	-
12. Life-Long Learning	-	-

4.5 Instructor's Role and Responsibility to Students

The instructor's role is to develop and deliver course material in ways that facilitate learning for a variety of students. Selected lecture notes will be made available to students on CourseLink but these are not intended to be stand-alone course notes. During lectures, the instructor will expand and explain the content of notes and provide example problems that supplement posted notes. Scheduled classes will be the principal venue to provide information and feedback for tests and project.

4.6 Students' Learning Responsibilities

Students are expected to take advantage of the learning opportunities provided during lectures and tutorials. Students, especially those having difficulty with the course content, should also make use of other resources recommended by the instructor. Students who do (or may) fall behind due to illness, work, or extra-curricular activities are advised to keep the instructor informed. This will allow the instructor to recommend extra resources in a timely manner and/or provide consideration if appropriate.

4.7 Relationships with other Courses & Labs

Previous Courses:

ENGG*2230: Fluid Mechanics; mass and energy conservation of fluid systems and the concept of boundary layer

ENGG*3260: Thermodynamics: thermodynamic principles of the chemical equilibrium and kinetics

ENGG*3430: Heat and Mass Transfer: Heat and mass transfer analogies

MATH*2270: Applied Differential Equations: Mathematics to solve mass transfer problems

Follow-on Courses:

ENGG*4260: Water and Wastewater treatment Design: mass transfer mechanisms and design principles of unit operations used for water and wastewater treatment

ENGG*4330: Air Pollution Control: mass transfer mechanisms and design methods of air purification processes.

5 TEACHING AND LEARNING ACTIVITIES

5.1 Timetable

Lectures:

Monday	9:30 – 10:20 am	MCKN 121
Wednesday	9:30 – 10:20 am	MCKN 121
Friday	9:30 – 10:20 am	MCKN 121

Tutorials:

Monday	01012, 01022, 01032, 01011	1:30 – 2:20 pm	MINS 037
	01021 01021	3:30 – 4:20 pm	MINS 037

Laboratory:

Lab1

Wednesday Jan 28, Feb 4	01031 01032	2:30 -4:20 pm	THRN1104
Thursday Jan 29, Feb 5	01011 01012	2:30 - 4:20 pm	THRN 1104
Friday Jan 30	01021 01022	11:30am - 1:20 pm	THRN 1104

Lab 2

Wednesday Feb 25, March 4	01031 01032	2:30 -4:20 pm	THRN1116A
Thursday Feb 26, Mar. 5	01011 01012	2:30 - 4:20 pm	THRN1116A
Friday Feb 27, March 6	01021 01022	11:30am - 1:20 pm	THRN1116A

5.2 Lecture Schedule

Lectures	Lecture Topics	References	Learning Objectives
1-5	Molecular diffusion and transport (1.5 weeks)	Chapter 1,2	1
5-12	Inter-face mass transfer (2.5 weeks)	Chapter 3	1
13-18	Adsorption (1.5 weeks)	Chapter 9 9.3, 9.4	2
19-24	Absorption/stripping operation (2 weeks)	Chapter 4 , 5	3
25-28	Membrane filtration (1.5 weeks)	Lecture notes	4
29-36	Environmental transport phenomena (3 weeks)	Lecture notes	5

5.3 Project and Lab Schedule

Week	Topic	Due
4-5	Aeration and oxygen transfer coefficient	Week 7, February 23 in Class
8-9	Ion exchange column adsorption	Week 11, March 23 in Class
9-10	Absorption design project	Week 12, March 27 in Class

5.4 Other Important Dates

Monday, January 5 2015: First day of class

Monday, February 16– Friday, February 20 2015: Winter Break

Friday, March 6: drop date

Friday, April 2 2015: last day of class

6 LAB SAFETY

Safety is critically important to the School and is the responsibility of all members of the School: faculty, staff and students. As a student in a lab course you are responsible for taking all reasonable safety precautions and following the lab safety rules specific to the lab you are working in. In addition, you are responsible for reporting all safety issues to the laboratory supervisor, GTA or faculty responsible.

If the laboratory rules are not followed, consequences will include removing access to the lab. If this results in lab work not being completed, the student will receive a grade of 0.

7 ACADEMIC MISCONDUCT

The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community faculty, staff, and students to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member.

7.1 Resources

The Academic Misconduct Policy is detailed in the Undergraduate Calendar:

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

A tutorial on Academic Misconduct produced by the Learning Commons can be found at:

<http://www.academicintegrity.uoguelph.ca/>

Please also review the section on Academic Misconduct in your [Engineering Program Guide](#).

The School of Engineering has adopted a Code of Ethics that can be found at:

<http://www.uoguelph.ca/engineering/undergrad-counselling-ethics>

8 ACCESSIBILITY

The University of Guelph is committed to creating a barrier-free environment. Providing services for students is a shared responsibility among students, faculty and administrators. This relationship is based on respect of individual rights, the dignity of the individual and the University community's shared commitment to an open and supportive learning environment. Students requiring service or accommodation, whether due to an identified, ongoing disability for a short-term disability should contact the Centre for Students with Disabilities as soon as possible

For more information, contact CSD at [519-824-4120](tel:519-824-4120) ext. 56208 or email csd@uoguelph.ca or see the website: <http://www.uoguelph.ca/csd/>

9 RECORDING OF MATERIALS

Presentations which are made in relation to course work—including lectures—cannot be recorded or copied without the permission of the presenter, whether the instructor, classmate or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

10 RESOURCES

The Academic Calendars are the source of information about the University of Guelph's procedures, policies and regulations which apply to undergraduate, graduate and diploma programs:

<http://www.uoguelph.ca/registrar/calendars/index.cfm?index>