

**SCHOOL OF ENGINEERING  
UNIVERSITY OF GUELPH  
ENGG 3470 Mass Transfer Operations  
Course Outline - Winter 2010**

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Angelique Rosenthal ([arosenth@uoguelph.ca](mailto:arosenth@uoguelph.ca)) (0.5)

**Lecture Times:** Monday, Wednesday, Friday; 1:30 – 2:20 PM, Mackinnon, Room 224

**Tutorials:** Tuesday 08:30 AM – 10:20 AM, MacDonald Institute, Room 106

**Labs:** Coordinated with tutorials; Science Complex 2101

**Prerequisites (s):** ENGG\*2230, ENGG\*3260, MATH\*2270

**Co-requisite (s):** ENGG\*3430

**Text Book/ Recommended Readings:**

The required text is a course reader that has been printed by the University of Guelph Bookstore: “ENGG\*3470 Mass Transfer Operations - Winter 2010 Course Reader”

This reader contains relevant material from two textbooks:

McCabe, W.L., Smith, J.C. and Harriott, P., 2005. “Unit operations of Chemical Engineering”

Nazaroff, W.W. and Alvarez-Cohen, L. 2001. “Environmental Engineering Science”

**NOTE:** The reader will be allowed as an aid during quizzes and exams but only if the reader has been purchased from the University of Guelph Bookstore (i.e. with copyright permissions).

Lecture notes and assignments will be provided through Courselink

The following books are useful as complementary readings for this course:

Incropera, F.P. Dewitt D.P. Bergman, T.L., Lavine, A.S., 2007, “Fundamentals of heat and mass transfer”, Sixth Edition, John Wiley & Sons, Inc.

Treybal, R.E. 1980. “Mass transfer Operations”, 3rd Ed, McGraw Hill Book Co.

**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 control and pollution prevention.

<b>Evaluation:</b>	<b>Value</b>	<b>Date(s)</b>
Term tests (2)	20% each	February 2 <sup>nd</sup> and March 16 <sup>th</sup>
Labs (2)	20% each	Reports due February 23 <sup>rd</sup> and TBD
Examination	40%	April 22 <sup>nd</sup> (7:00 – 9:00 pm)

Please refer to the University of Guelph, Undergraduate Calendar at

[www.uoguelph.ca/registrar/calendars/guelphhumber/current/c07/c07-amisconduct.shtml](http://www.uoguelph.ca/registrar/calendars/guelphhumber/current/c07/c07-amisconduct.shtml)

regarding academic misconduct. The School operates on a zero-tolerance policy in these matters.

**Tutorial & Assignments:** The main purpose of the tutorials is 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.

**Labs:** Two laboratory assignments have been developed to complement the lecture material; the lab scheduling will be confirmed in early January. Students are required to attend the labs, collect and analyze the data, and write a report. The specific requirements and marking criteria will be outlined in advance of each lab. Laboratory reports will be graded for grammar and writing style as well as technical content.

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 (9 lectures)**

- Diffusion and Fick's law
- Convective mass transfer and dispersion
- Film theory
- Interphase mass transfer

#### **Part II: Applications of mass transfer theories**

##### Adsorption/stripping operation (6 lectures)

- 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 (6 lectures)

- Introduction
- Solid water distribution equilibrium
- Mass transfer in fixed beds
- Granular bed adsorption operation
- Powder activated carbon adsorption
- Applications of adsorptions processes

##### Membrane processes (6 lectures)

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

##### Transport processes in nature environment (7 lectures)

- General mass transfer equations
- Case study of mass transfer processes in nature environment

### **Disclaimer :**

The instructors reserve the right to change any of the above in the event of appropriate circumstances, subject to University of Guelph Academic Regulations.