Mass Transfer Operations
ENGG 3470
Winter 2004

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Lecture schedule:	M, W, F	10:30 - 11:20 (CRSC 116)
Tutorials:	Th	14:30 - 16:20 (CRSC 117)

Prerequisites: As stated in the U of G Calendar

Textbook:

Reading materials and lecture notes will be provided via WebCT.

Your Heat and Mass Transfer Text (Incropera and DeWitt) provides some excellent complementary material. Specific mass transfer material is given in Chapters 14 and 6 and Sections 7.4, 7.7, 7.8, 7.9, 8.9; however, the analogous character of momentum, heat and mass transfer make the entire book useful.

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.

Grading

Final Exam	35%
Tests (2)	40% (Feb. 12 and March 11)
Design project	15% (Due March 23)
Experiment Design	10% (components due throughout the term)

Tutorials & Assignments

Tutorials will be used for two purposes: to strengthen students' understanding of mass transfer operations through reviewing examples, and to discuss the assigned projects. A large number of review problems with solutions will be made available to the students. These review problems provide an opportunity for the students to better understand the course materials. All students are strongly encouraged to complete some of these problems either individually or in groups. Additional examples will be provided by the teaching assistants during some of the tutorials.

Design Project

The students will be divided in groups of five and each group will be designing, building and testing a small mass transfer unit. These units are to be built with simple materials found in a hardware store. Each group will prepare a short report on the design and operation of each unit.

Experiment Design

Throughout the semester we will be collectively designing and building a gas-liquid mass transfer unit (an aeration testing device) to be used in this course in future years. As we progress, you will be given a variety of mini-design tasks to complete in support of our work. The content of this work is eligible for evaluation in the exams/tests.

Topic Outline

1. Introduction
2. diffusive mass transfer
3. convective mass transfer and dispersion
4. Film theory
5. Mass transfer in the natural environment
6. Interphase mass transfer
7. Mass transfer in porous media
8. Mass transfer applications
    a. Absorption
    b. Adsorption
    c. Aeration
    d. Air stripping
    e. Biofiltration
    f. Membrane separation

Recommended Readings

Middleman, S. 1998. An Introduction to Mass and Heat Transfer – Principles of Analysis and Design. John Wiley & Sons, Inc.

Nazaroff, W.W., and Alvarez-Cohen, L. 2001. Environmental Engineering Science (Chapter 4). John Wiley & Sons, Inc.

Brodkey, R.S., and Hershey, H.C. 1996. Transport Phenomena – A Unified Approach. McGraw-Hill Book Company.

McCabe, W.L., Smith, J.C., and Harriott, P. 1998. Unit Operations of Chemical Engineering. McGraw-Hill Book Company.

Materials posted on the course WebCT.

Disclaimer

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