

CM3120**Transport/Unit Operations 2**
Course No. 10051**Sp 2009**

Course Objectives:

- Objective 1: To develop and detailed understanding of the physical and chemical basis behind mass transport in chemical engineering systems.
- Objective 2: To learn solution techniques in heat and mass transport problems, including basic analytical and numerical approaches.
- Objective 3: To apply mass transport theory to the solution of practical chemical engineering problems in both equilibrium- and rate-based separations (also called Unit Operations).

Instructor: Professor David R. Shonnard (202I, CSEB)
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Teaching Assistant: Jifei Liu, graduate student, (401, CSEB)
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Office hours: Tue. and Thur. 2-4

Time: MWF 9:05 – 9:55 am

Location: Room 642, Dow Environmental Sciences and Engineering Building

Text: Required: Geankoplis, Transport Processes and Separations Process Principles, 4th Edition, Prentice Hall, 2003.

Web site: <http://www.chem.mtu.edu/~drshonna/cm3120/index.html>

Course Policies and Procedures

Homework

Homework will be assigned regularly, normally once per week. One week will be allowed for each assignment (most of the time). Homeworks will be graded, and, examinations will be based on homework materials in addition to the lecture and chapter readings. You are allowed to work in groups on the homework, but you must turn in your own work. Copying of other's work will be dealt with as a violation of university academic integrity policy, and will be dealt with accordingly. Homework assignments and solutions will be posted on the course website. 40% of the course grade is homework.

Examinations

There will be three exams. All examinations will be open-book and will have equal weight in calculating the final grade for the course (20% of the final grade for each examination). Make-up exams will be given only for valid written excuses prior to the exam, subject to the arbitrary judgment of the instructor.

Course Grade Policy

The weighting of the examinations and report will be as follows

Mid-term I	(mid February)	20%	100 pts
Mid-term II	(early April)	20%	100 pts
Mid-term III	(early May)	20%	100 pts
Homework (Collectively)		30%	100 pts each
In-class quizzes		10%	100 pts each

Letter Grades will be assigned following this schedule

90-100%	A	70-75%	C
85-90%	AB	65-70%	CD
80-85%	B	60-65%	D
75-80%	BC	<60%	F

Course Assignments

Read the Chapter Sections assigned for the day BEFORE coming to class for best results

Week	Date	Topics	Chapter.Section (Geankoplis)	Assignments, ..
1	Monday January 12, 2009	Crs. Review, Transient Heat Transfer, Analytical Soln.	5.3	
	Wednesday January 14, 2009	Transient Heat Transfer, Spreadsheet Solutions	5.4	
	Friday January 16, 2009	Transient Heat Transfer, Matlab Solutions	5.4	HW1
2	Monday January 19, 2009	Class Cancelled, Martin Luther King Jr. Day		
	Wednesday January 21, 2009	Introduction to Diffusion; Fick's Law	6.1, 6.2	
	Friday January 23, 2009	Diffusion in Gases; Diffusion Coefficients in Gases	6.2	HW2
3	Monday January 26, 2009	Diffusion in Liquids; Diffusion Coefficients in Liquids	6.3, 6.4	
	Wednesday January 28, 2009	Diffusion in Solids; Diffusion Coefficients in Solids	6.5	
	Friday January 30, 2009	Numerical Solutions to Diffusion Problems		HW3
4	Monday February 2, 2009	In-Class Quiz	6.6	
	Wednesday February 4, 2009	Unsteady State Diffusion: Introduction	7.1	
	Friday February 6, 2009	Class Cancelled, Winter Carnival		
5	Monday February 9, 2009	Concentration Distributions: Analytical Methods	7.1	
	Wednesday February 11, 2009	Unsteady-State Diffusion, Convection, and Reaction	7.5	
	Friday February 13, 2009	Concentration Distributions in Laminar Flow	7.3C	HW4
6	Monday February 16, 2009	In-Class Quiz		
	Wednesday February 18, 2009	Solutions to Diffusion and Reaction Problems	7.5D, 7.5E	
	Friday February 20, 2009	Dimensional Analysis: Mass Transfer Coefficients	7.8, 7.3, 7.4	HW5
7	Monday February 23, 2009	Review of Chapters 6, 7		
	Wednesday February 25, 2009	Midterm Exam 1 (evening TBD): Class Cancelled		
	Friday February 27, 2009	Special Topics: Pollutant Dispersion	Handouts	I-CP
8	Monday March 2, 2009	Special Topics: Electrochemical Deposition	Handouts	I-CP
	Wednesday March 4, 2009	Special Topics: Measuring Diffusion Coefficients	Handouts	I-CP
	Friday March 6, 2009	Special Topics: Capping Contaminated Sediment	Handouts	I-CP
Break		No Classes all Week		No Assignments
	Monday March 16, 2009	Evaporation: Introduction Topics	8.1 – 8.3	

9	Wednesday March 18, 2009	Evaporation: Single-Effect	8.4	
	Friday March 20, 2009	Evaporation: Double-Effect	8.5	HW6
10	Monday March 23, 2009	Drying: Introduction Topics	9.1-9.5	
	Wednesday March 25, 2009	Drying: Constant Rate and Falling Rate Methods	9.6, 9.9	
	Friday March 27, 2009	Drying: Batch and Continuous Operations	9.10, 9.11	HW7
11	Monday March 30, 2009	Gas-Liquid Separations: Introduction and Equilibrium	10.1, 10.2, 10.4	
	Wednesday April 1, 2009	Absorption in Equilibrium Tray / Packed Towers	10.3, 10.6	
	Friday April 3, 2009	Review for Midterm Exam 2	10.5, 10.6	HW8
12	Monday April 6, 2009	Midterm Exam 2 (evening TBD): Class Cancelled	12.1, 12.2	
	Wednesday April 8, 2009	Adsorption: Introduction and Batch Processes	12.3	
	Friday April 10, 2009	Adsorption: Design of Fixed-Bed Columns		HW9
13	Monday April 13, 2009	Membrane Separations: Introduction	13.1-13.3	
	Wednesday April 15, 2009	Membrane Separations: Mixed Model	13.4	
	Friday April 17, 2009	Applications: Reverse Osmosis / Ultrafiltration	13.9-13.11	HW10
14	Monday April 20, 2009	Filtration	14.1-14.2	
	Wednesday April 22, 2009	Centrifugation	14.4-14.5	HW11
	Friday April 24, 2009	Review for Midterm Exam 3		
Finals	Monday – Friday April 27-May 1, 2009	Midterm Exam 3 (evening TBD)		

I-CP = In-class participation in problem solving.