ChE 312
Spring 2011

Separation Processes

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Class: 1100-1215 TR, 1300-1450 W 401 ESB

Text: Wankat, P. C., *Separation Process Engineering (2nd ed.)*, Prentice-Hall, 2007.

Course Objectives:

1. Students will be able to apply material and energy balances to staged-separation devices.
2. Students will be able to determine the number of stages required in staged separation devices.
3. Students will be able to determine the capacity of staged separation devices.
4. Students will be able to analyze the performance of existing staged separation devices.
5. Students will be able to determine the height required in continuous differential separation devices.
6. Students will be able to determine the capacity of continuous differential separation devices.
7. Students will be able to analyze the performance of existing continuous differential separation devices.
8. Students will understand the role of reflux ratio in distillation problems.
9. Students will understand the influence of thermodynamics in flash vaporization and distillation columns.
10. Students will understand and be able to solve problems associated with the auxiliary equipment in distillation columns.
11. Students will be able to determine the size specifications required in membrane separation devices.
12. Students will be able to determine the capacity of membrane separation devices.
13. Students will be able to analyze the performance of existing membrane separation devices.
14. Students will be able to use Chemcad to solve the above problems.
15. Students will be able to apply the above knowledge to the solution of a design problem.
16. Students will increase their proficiency in oral and written communication.

Course Policies (exceptions at discretion of instructor):

1. There are no make-up exams.
2. All problem sets are due at the beginning of class or at the stated time.
3. A late assignment = no assignment.
4. Exam grading appeals must be submitted in writing on the day the exam is returned. If you miss that class, you lose the opportunity for regrading.
5. Any classes canceled due to inclement weather (or for any other reason, such as fire alarms) will be rescheduled.

6. If the fire alarm goes off during an exam, the resolution of the situation is solely at the discretion of the instructor.
7. Your cellular/smart phone/PDA should be turned off during class. If your cellular phone rings during class, if your smart phone/PDA sounds an alert, if you are observed texting during class, if you are observed using any electronic device during class, or if you are observed using the internet during class, your final grade will be reduced by one percentage point, and you will be asked to leave the class and not return on that day. You will still be responsible for all material covered in class. If the phone rings during an exam, you will be evaluated on the portion of the exam completed before being asked to leave. If you are observed texting, using a PDA, or using the internet during an exam, you will automatically receive a zero for that exam.
8. You may (and are encouraged to) work in groups on problem sets. However, what you submit must be your own work. Assignments that are obviously copied will receive no credit.
9. Problem sets, quizzes, and exams should be neat and easy to follow. Each problem should start on a new page (exception – very short problems at beginning of semester). Credit will be deducted for sloppy work that is hard to follow.
10. Your answer to a problem on an exam or on a problem set should be boxed, have units as appropriate, and have the correct number of significant figures. There will be a 20% deduction, per occurrence, for answers which significantly exceed the correct number of significant figures. There will also be a 20% deduction for missing or incorrect units. You should round off only the final answer to the correct number of significant figures. If you round off intermediate calculations, thereby making your final answer inaccurate, significant credit may be deducted.
11. Problems should be worked in the units provided (SI or American). No credit will be given on exams or on problem sets for problems not worked in the units provided. This means that no credit will be awarded if you convert a problem in American units to SI, work the problem in SI units, and convert the answer back to American units (or vice-versa). Credit will also be deducted for missing or incorrect units.
12. If you do not participate in the design project as part of your assigned group, your grade for the entire course will automatically be an F, regardless of other grades earned.
13. You must be in the audience for all of the junior design presentations. This means in the classroom, not in the hall or in the computer room. Failure to do so will result in reduction by one full letter on your design project grade.

Grading:	Problem Sets	10%
	2 closed-book quizzes @ 7.5%	15%
	2 exams @ 17.5%	35%
	Design Project	20%
	Final Exam	20%

Grades:	The nominal grading scale is	≥90% A
		≥80% B
		≥70% C
		≥60% D
		<60% F

At the instructor's discretion, this scale may be lowered, but not raised.

Approximate Syllabus

(class time changes that are known at this time are in red)

Class	Date	Topic	Reading	Assignment Due
1	1/11	Introduction, Flash Operations	1, 2	
2	1/12	Flash Operations and Examples	2	
3	1/13	Distillation	3	
4	1/18	Distillation	4	PS 1
5	1/19	Distillation Examples		
6	1/20	Other Distillation Situations Using Chemcad		
7	1/25	Multicomponent Distillation – Shortcut	5-7	
8	1/26	Multicomponent Distillation Examples		
9	1/27	Advanced Distillation Situations/Examples	8	PS 2
10	2/1	Batch Distillation	9	
11		Tray Distillation Equipment		
12	2/2	**Closed-book quiz 1** Batch Distillation Lab		
13	2/3	Tray Distillation Equipment Examples	10	PS 3
	2/8	no class – two CHE 325 classes		
14	2/9	Tray Distillation Equipment Examples		
15	2/10	General Multistage Separations		PS 4
16	2/15	Review		
17	2/16	**EXAM 1**		
18	2/17	Absorption/Stripping	12	
19	2/22	Absorption/Stripping Examples		
20	2/23	Extraction and Examples	13	
21	2/24	Other Staged Separations	13	PS 5
22	3/1	Staged Separation Performance		
23	3/2	Mass Transfer Principles Mass Transfer Between Phases	15	
24	3/3	Mass Transfer Coefficients		PS 6
25	3/8	Differential Separations	15	
26	3/9	Differential Separations Examples		
27	3/10	Packed Bed Equipment	15	PS 7

28	3/15	Packed Bed Examples		
29	3/16	**Closed-book quiz 2** Packed Bed Examples		
30	3/17	Membrane Separations	16	PS 8
31	3/29	Gas Permeation	16	
32	3/30	Reverse Osmosis	16	
33	3/31	Ultrafiltration	16	PS 9
34	4/5	Review		
35	4/6	**Exam 2**		
36	4/7	Design		
37	4/12	Design		
38	4/13	Design		
39	4/14	Design		
40	4/19	Design		
41	4/20	Design Oral Presentations		
42	4/21	Design Oral Presentations		
43	4/26	Filtration	Geankoplis	
44	4/27	Filtration	Ch. 14.2	
45	4/28	Review for Final Design Project Debriefing		PS 10
	5/4	**FINAL EXAM 3-5 PM**		