Chemical and Biochemical Engineering Separations

CHEN 4140, Fall 2008
Mon and Wed 4:10pm-5:25pm, 633 Mudd Building

Professor: Scott Banta sbanta@cheme.columbia.edu
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Office Hours: Mon and Wed 3:00 pm - 4:00 pm, or by Appointment.

Teaching Assistants:
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Course Description:
Design and analysis of unit operations employed in chemical and biochemical separations. Emphasis is placed on learning the fundamental aspects of distillation, gas absorption, crystallization and bioseparations through a combination of lectures, open-ended problem solving, self-learning exercises and computer process simulation.

Course Objectives:

1. Establish fundamental principles of separation processes.
2. Develop the capability to design staged, continuous contact and batch operations.
3. Provide facility in the use of computer simulation tools to analyze and design separation processes.
4. Provide a transition from engineering science to engineering operations.
5. Promote a team approach and self-learning through open-ended group projects and problem solving.
6. Develop oral communication skills.

Textbook:
Required: Seader, J.D. and E.J. Henley, *Separation Process Principles, 2nd Edition* Wiley, 2006
Your undergraduate Chemical Engineering Transport and Thermodynamics books will be useful references as well.

Lecture Notes:
Lectures will be presented in Power Point and Excel. The lecture files will be placed on the Courseworks website at least 24 hours before the lecture.

Recitation:
The recitation section: Thursday 10:30-11:30am, 834 Mudd
One of the TAs will lead the recitation section, and this time will be used to go over additional problems that are similar to the homework assignments, and to answer questions that were not covered in class. Immediately following recitation, the TA will hold office hours in 822 Mudd to go over specific homework questions and questions about homework grading.

Computer Software for Simulations:
Occasionally problems will be assigned that require the use of computer software for simulations, such as SuperPro, Aspen Plus or Excel. When a homework problem does not specify the use of these programs, the assignment must be completed without them. However, checking your final answers using the software is allowed and encouraged.

Grading:

Homework	20%
Midterm exam	25%
Final exam	35%
Group project	20%

Other Points:

- Students are encouraged to *collaborate* on the homework assignments, however copying of homework assignments **will not be tolerated**.
- Use of a solution from a solution manual **will not be tolerated**. This will result in an automatic grade of 0 for the homework assignment, and this will be reported as an act of academic dishonesty.
- Homework will be assigned on Wed and will be due the following Wed in class. Late homework (within 24 hours) will receive a **25% deduction**. After 24 hours the homework **will not be accepted**.
- Midterm and final exams will be open book and open notes.
- Groups will be assigned for a separations group project and both oral and written reports will be due at the end of the semester. Additional information will be provided at a later date.
- Courseworks system will be used for course maintenance and information dissemination.

Approximate weekly schedule

Week		Topic	Chapters
1	9/3	Introduction to Separation Processes	1
2	9/8, 9/10	Review of Thermo and Transport	2, 3
2	9/15, 9/17	Single Equilibrium Stages and Flash Calculations	4
3	9/22, 9/24	Cascades	5
4	9/29, 10/1	Absorption and Stripping	6
5	10/6, 10/8	Distillation of Binary Mixtures	7
6	10/13, 10/15	Review and Midterm on 10/15	
7	10/20, 10/22	Multicomponent, Multistage Separations	9
8	10/27, 10/29	Liquid-Liquid Extraction, Crystallization	8, 17
9	11/5	Membranes	14
10	11/10, 11/12	Bioseparations and Chromatography	15
11	11/17, 11/19	(AIChE) Group Projects, Computer Simulations	
12	11/24, 11/26	Batch Distillation, Group Projects	13
13	12/1, 12/3	Group Project Presentations	
14	12/8	Final Review	
15	TBD	Final Exam	