Chemical Engineering/ Environmental Engineering CENG/ENVE 210a
Principles of Chemical Engineering and Process Modeling - Fall 2009

Prerequisites: Math 120 a or b, ENAS 151a, or permission of instructor

Text: *Elementary Principles of Chemical Processes*, 3rd ed., R.M. Felder and R.W. Rousseau, Wiley, New York, 2005. (Hard Book and Student Workbook)

Lectures: MW 1-2:15 p.m.

Instructor: Prof. André D. Taylor, 204 Mason Lab, (203) 432-2217, Andre.Taylor@yale.edu

TA Ryan Sekol, 117 Mason Lab, (203) 432-5206 Ryan.Sekol@yale.edu

Web page: http://students.yale.edu/oci/search.jsp

OFFICE HOURS Prof. Taylor MW 10:00 – 11:00 a.m.
Mr. Ryan Sekol T TH 1:00-2:00 p.m.

COURSE OBJECTIVES: At the conclusion of this course, you should be able to:

- Develop an appreciation of the breadth and depth of chemical engineering
- Search the chemical engineering literature and give an oral presentation
- Write and solve material balances for simple chemical engineering processes, including those with multiple units, recycle, bypass, and reactive systems
- Solve problems involving multiple phases, by using Gibb's phase rule, Raoult's and Henry's Laws
- Solve Problems involving vapor-liquid equilibrium for both single phase and multiphase systems.
- Perform energy balances for the solution of simple closed and open systems, including those requiring hypothetical process paths, heats of mixing, solution, reaction, and formation
- Solve problems involving energy and environmental emphasis
- Demonstrate an awareness of ethical considerations in professional practice

HOMEWORK There will be periodic homework assignments throughout the semester which should be submitted at the start of class on their due date. Some of these problems will be graded. Students are permitted to work together on homework, but each student must compose and submit his/her own solutions. **Homework should be neat and completed on engineering paper.** Noncompliance will result in a 10% deduction. Late homework will be deducted 10% per day including weekends and will not be accepted after the graded homework has been returned to the class.

EXAMS There will be two hourly exams, and one final exam. All exams will be **open book**. In addition you will be allowed to bring in one hand-written double-sided sheet of notes or equations. NO additional materials (other books, class notes, old exams, old quizzes, homework sets, and other worked out problems) will be allowed during the exams. The date and location of the final exam will be announced during the semester.

GRADING

Homework	150
Exam I	100
Exam II	100
Final Exam	150
Special Project	100
Total	600 points

Regrade requests:

Requests for regrading of a homework or exam must be submitted **in writing within one week** of return of the assignment. To submit a regrade request, attach a written note describing the work to be regraded to the document, and return it to Prof. Taylor. **Late requests will not be honored.**

Students with disabilities

Prof. Taylor is available to discuss appropriate academic accommodations that may be required for a student with disabilities. Requests for academic accommodations are to be made during the first three weeks of the semester, except for unusual circumstances, so arrangements can be made. Students are encouraged to register with the Yale Resource Office on Disabilities to verify their eligibility for appropriate accommodations.
Campus Location: 100 Wall Street, 103 WLH Mail Address: P.O. Box 208305 New Haven, CT 06520-8305 Phone: (203) 432-2324 TTY/TDD: (203) 432-8250
http://www.yale.edu/rod/

TENTATIVE LECTURE SCHEDULE – **Subject to change**

	Date	Topic	Reading **Due**
Introduction			
W	Sept. 2	Introduction to chemical engineering	Chapter 1
Introduction to Engineering Calculations			
M	Sept. 7	Units, calculations, estimation, dimensionless quantities, process data representation and analysis	Chapter 2
Chapter 3: Processes and Process Parameters			
W	Sept. 9	Mass, volume, flow rate, chemical composition, pressure, temperature	Chapter 3
Chapter 4: Fundamentals of Material Balances			
F	Sept. 11	Material balance basics, flowcharts	Sec. 4.0-4.3a
W	Sept. 16	Balances and bookkeeping	
M	Sept. 21	Multiple unit processes	Sec. 4.4
W	Sept. 23	Recycle and bypass	Sec. 4.5
M	Sept. 28	Balances on reactive systems	Sec. 4.6
W	Sept. 30	Atom balances	Sec. 4.7
M	Oct. 5	Exam I Review	
W	Oct. 7	First Exam	
M	Oct. 12	Combustion reactions Excess air	Sec. 4.8-4.9
W	Oct. 14	Liquid and solid densities, Ideal gases	Sec. 5.0-5.2
M	Oct. 19	Single-component phase equilibrium and The Gibbs Phase Rule	Sec. 6.0-6.2
W	Oct. 21	Gas-liquid systems – One condensable component	Sec. 6.3

M	Oct. 26	Gas-liquid systems – Multicomponent systems	Sec. 6.4
W	Oct. 28	First law of thermodynamics Kinetic and potential energy	Sec. 7.0-7.3

Chapter 7: Energy and Energy Balances

M	Nov. 2	Energy balances on open systems at steady state	Sec. 7.4
W	Nov. 4	Tables of thermodynamic data	Sec. 7.5

Chapter 8: Balances on Nonreactive Processes

M	Nov. 9	OR F Nov. 6 - Exam II Review	TBD
W	Nov. 11	Second Exam	TBD
M	Nov. 16	Energy balance procedures	Sec. 7.6
W	Nov. 18	Energy balance calculations	Sec. 8.0-8.3
M	Nov. 23	Fall Recess	
W	Nov. 25	Fall Recess	

Chapter 9: Balances on Reactive Processes

M	Nov. 30	Heats of reaction, formation reactions heats of formation, heats of combustion	Sec. 9.0-9.4
W	Dec. 2	Energy balances on reactive processes	Sec. 9.5
M	Dec. 7	OR W Dec. 9 - Final Review	
M	Dec. 14	Final 2:00 p.m.	Location TBD