The University of Iowa
Department of Chemical and Biochemical Engineering

052:041—Process Calculations Fall, 2011

Instructor: Dr. Jessop
4130 Seamans Center
335-0681
jjessop@engineering.uiowa.edu
http://icon.uiowa.edu

TA: Jon Bachman
G138 Seamans Center
jonathan-bachman@uiowa.edu

Office Hours:

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Course Description:
This course will introduce you to the fundamental principles of chemical process analysis. It will equip you with problem solving techniques and will give you experience in the application of these techniques to a wide variety of process-related problems. During this course you will: i) learn to synthesize and integrate process information; ii) develop critical thinking and analytical skills; iii) develop the ability to explain engineering concepts in your own words; and iv) gain valuable experience in teamwork.

Textbook: *Elementary Principles of Chemical Processes*, 3rd Edition, R.M. Felder and R.W. Rousseau, John Wiley and Sons, 2005.

Homework: (10% of grade)
Homework is due at the **beginning** of class on the day it is due. Late homework will not be accepted.

True learning of the course concepts must begin with practice, and the homework provides you with the opportunity to apply the course concepts to realistic (although in some cases simplistic) engineering problems. Group discussion of the problems is allowed (and even encouraged); however, homework is to be completed individually and professionally. Homework that has been copied, either from another student or from a solutions set, will be assigned a zero.

For all assignments, follow homework presentation guidelines listed on ICON, including:

- Always show all of your work (it should be clear how the problem was solved)
- Always carry along units in your calculations
- Always display an appropriate number of significant figures in your final answer
- Always box in or underline your final answer and include units

Homework not adhering to these guidelines will be returned with a warning for the first offense, with a grade penalty for the second offense, and with no grade for any offenses thereafter.

Quizzes: (10% of grade)
A total of 12 quizzes (15-20 minutes) covering material included in the homework handed in that day will be given on Fridays throughout the semester. Only the top 10 scores will count towards the final grade. There will be no make-ups for missed quizzes.

Exams: (three exams, 20%, 20%, and 20% each, 60% total)
The first exam is tentatively scheduled for the **evening** of September 22 (Thursday); the date of the second exam is tentatively scheduled for the **evening** of October 18 (Tuesday). The final exam will be given in the scheduled period during finals week: Thursday, December 15, at 12:00 PM. Unless otherwise announced, these exams will be closed-book, with two hours to complete the problems.

A makeup exam may be arranged if you notify me **before** the regularly scheduled exam with a valid reason for missing the exam. Verifiable illness with notification from a doctor or family emergencies may be valid

reasons for missing an exam.

Group Projects and Reports: (15% of grade)
You will complete material and/or energy balances for various production units and prepare a report recommending the best operating procedures. You will work together in interdependent groups of 3-4, with each group member assuming a different role essential to the success of the project. Anyone not participating in these projects will automatically receive an F for 052:041, regardless of other grades earned in this class.

Topical Paper: (5% of grade)
This writing assignment will consist of a 500-1000 word (~1-2 single-spaced pages) report written for a general audience. Possible topics include: Sustainable energy in the future, future developments in biotechnology, or any other future development that chemical engineers are destined to impact. A draft of your paper (due September 16) will initially be evaluated by the Hanson Center for Technical Communication (30% of the final topical paper grade), and your final rewrite will be evaluated by Dr. Jessop (due October 10).

Professionalism: Since this is the first course in the chemical engineering curriculum it is a good time to reinforce positive patterns of professionalism and class conduct. Learning should be fun and interesting, but at the same time, you should approach everything you do with high professional standards. Professional traits include honesty, integrity, courtesy to others, and a clear motivation to understand and master the subject matter of the course.

Course Learning Goals:

- By the end of the course the student will be able to perform material balances on systems including, but not limited to, single unit processes, multi-unit processes, recycle, bypass, chemical reaction and combustion systems.
- By the end of the course the student will be able to choose and apply the simplest equation of state that yields accurate results for the problem under consideration, including the ideal gas law, compressibility equation of state and cubic equations of state.
- By the end of the course the student will understand and be able to apply relationships that describe phase equilibria (gas/liquid and liquid/liquid) including Raoult's Law, Henry's Law, the Gibbs Phase Rule, phase diagrams and thermodynamic tables.
- By the end of the course the student will be able to perform energy balances on closed and open systems, with and without chemical reactions, either independent of or simultaneous with mass balances.
- By the end of the course the student will have had opportunities to further his/her professional development through studying professional ethics, practicing written communication skills and being exposed to contemporary issues.

This course is given by the College of Engineering. This means that class policies on matters such as requirements, grading, and sanctions for academic dishonesty are governed by the College of Engineering. Students wishing to add or drop this course after the official deadline must receive the approval of the Dean of the College of Engineering. Details of the University policy of cross enrollments may be found at: http://www.uiowa.edu/~provost/deos/crossenroll.doc