CM2110
Fundamentals of Chemical Engineering I

Curricular Designation: Required

Catalog Description:

Application of chemical engineering fundamentals to the design and analysis of chemical processes. Mass balances, energy balances, and fundamental concepts are applied. Introduces use of Process Flowsheet Simulation Software.

Textbooks(s) and/or Other Required Materials:

Felder, R.M. and Rousseau, R. W., Elementary Principles of Chemical Processes 3rd edition, Wiley, 1999.

Prerequisites by Topic:

CH 1110 or CH 1100 or CH 1112 – Mastery of the general topics of chemistry appropriate to a first year college chemistry course.

Mastery of college algebra.

Course Objectives:

- Mastery of the application of mass and energy balances to chemical engineering processes
- Mastery of problem-solving skills in mass and energy balances.
- Introduction to your training as a chemical engineer
- Introduction of what chemical engineers do

Topics Covered:

1. Course Organization/Introduction, AIChE video, Units/Dimensions, P&ID
2. Units/Dimensions and Density, Pressure, Temperature
3. Chemical Composition/Ideal Gas Law
4. Fundamentals of Material Balances
5. Mass Balances on Multiple Unit Processes
6. Mass Balances for Recycle and Bypass Situations
7. Mass Balances for Reactive Systems
8. Multiphase Systems
9. Energy and Energy Balances
10. Energy Balances on Nonreactive Processes
11. Energy Balances on Reactive Processes

Class/Laboratory Schedule (note: 1 hour = 50 minutes)**:**

Lecture: 40.5 hours = 3 hours/week for 14 weeks; one 1.5 h holiday

Contribution of Course to Meeting the Professional Component: Engineering Topics

Relationship of Course to Program Outcomes:

Outcome	Topics and Level of Coverage			Comments/Examples
	Important	***Moderately important***	***Not covered***	
a) Apply knowledge of mathematics, science, and engineering	all			Via all topics
b) Design and conduct experiments, analyze and interpret data			X	
c) Design a system, component, or process to meet desired needs			X	
d) Function on a multi-disciplinary team			X	
e) Identify, formulate, and solve engineering problems	all			Via all topics, especially mass and energy balances with and without chemical reactions
f) Understand professional and ethical responsibility		1		Via class
g) Communicate effectively		1		Via two class projects, exams/quizzes/final, and ongoing communications with instructor and teaching assistant
h) Understand global and social impact of engineering solutions		1		Via class discussions on current chemical engineering topics and the AIChE video on this course website
i) Recognize the need for life-long learning		1		Via class discussions, the AIChE video, and the Career Fair discussion
j) Demonstrate knowledge of contemporary issues		1		Via class discussions and AIChE video
k) Use the techniques and tools of modern engineering practice		1		Via Project 1: PI&D Visio

Relationship of Course to AIChE Program Criteria:

Outcome	Topics and Level of Coverage			Comments/Examples
	Important	***Moderately important***	***Not covered***	
A-1) Thorough grounding in chemistry and a working knowledge of advanced chemistry such as organic, inorganic, physical, analytical, materials chemistry, or biochemistry, selected as appropriate to the goals of the program		3,7,11		Ideal gas law, mass and energy balances on reactive systems
A-2) Working knowledge, including safety and environmental aspects of material and energy balances applied to chemical processes	all			
A-3) Thermodynamics of physical and chemical equilibria		3,8		Ideal gas law, mulitphase systems
A-4) Heat, mass, and momentum transfer		9,10		Mechanical energy balance
A-5) Chemical reaction engineering		7,11		Mass and energy balances on reactive systems
A-6) Continuous and stage-wise operations		5,6		Distillation problems
A-7) Process dynamics and control			X	
A-8) Process design			X	
A-9) Modern experimental and computing techniques		1		Project 1: Visio P&ID

Prepared by:

Julia King, Professor of Chemical Engineering, January 13, 2010