Syllabus

Department of Chemical Engineering

University of Texas at Tyler

CHEN 2310 – INTRODUCTION TO CHEMICAL ENGINEERING

Fall Semester 2019

Instructors:

Fernando Resende, E-mail: fresende@uttyler.edu

Michael McGinnis, E-mail: MMcGinnis@uttyler.edu

Office Hours: (with Dr. Resende): 11:00am – 12:00 pm Tuesday and Wednesday (or e-mail to suggest an alternate time if there is a conflict). Instructor will be available at his office (RBN 2043/2045) and also online via Chat in Canvas.

Pre-Requisites:

CHEM 1312 – General Chemistry II

CHEM 1112 – Chemistry Lab II

Course Objectives:

The objective of this course is to introduce the field of Chemical Engineering, discuss career paths, and provide students with the knowledge necessary to carry out basic engineering calculations related to chemical processes. The course focuses on Material and Energy balances around unit operations or groups of unit operations in Chemical Processes. Calculations will be related to practical examples in the chemical industry. Students taking this course should develop the ability to apply the conservation laws to calculate flow rates, chemical composition and heat requirements of non-reactive and reactive systems containing multiphase streams. These may include solid, liquid, and gaseous components.

Learning Goals:

Students taking this course should develop an understanding of what is Chemical Engineering and its career opportunities, and should learn how to apply the conservation laws to analyze complex processes. They will learn to use basic engineering principles and how they can be applied to close mass and energy and balances in unit operations. This course emphasizes the use

of techniques and problem-solving skills that form the fundamental basis for the understanding of chemical processes.

Structure:

This course will be administered as a ***Hybrid/Online*** course. Please contact Dr. McGinnis for information about the classroom meetings during this period. The online portion will be administered by Dr. Resende, who will periodically post lectures online in the form of Power Point Slide Shows. The students can watch the lectures at any point during the week, prior to the chat time. After the first month, the class will transition to regular classroom meetings only.

Textbook (Required):

Richard Felder, Ronald Rousseau, & Lisa Bullard; Elementary Principles of Chemical Processes, John Wiley & Sons, New York, 2015, 4th Edition. (***F&R***)

Practice Problems:

At several points during the course, the Instructor will post a small set of practice problems intended to take about fifty minutes of the students' time (along with their solutions). The students should attempt to solve the problems on their own, and use the solutions to check their work. These will be the students' opportunity to practice problem-solving skills applying the concepts learned in lectures. These skills will be needed for solving homework and exam problems.

Participation grade:

Students are expected to be engaged during the course. The instructor will assign a participation grade (from 0 to 10) to each student based on interactions with the students, especially in office hours/chats. Asking questions via e-mail is also a form of participation.

Homework:

The instructor will schedule four homework assignments during the course of the semester. For each homework problem, I will provide the corresponding topic and numerical answers. You are encouraged to work in groups, but the work that you turn in should be your own.

Reading materials:

Every lecture has reading materials associated with it. The schedule below presents a detailed breakdown of what is going to be covered in each lecture, and the corresponding section of the

book. Students who read the corresponding sections of the book *before each class* will certainly make the most of the lectures, so this is highly recommended.

Exams:

There will be one midterm exam and one final exam.

Grading:

The final grade will be a combination of:

Homeworks: 30 %

Midterm Exam: 30 %

Final Exam: 30 %

Participation grade: 10 %

Missed Exams:

If you miss an exam because of ***unforeseen circumstances***, you can contact the instructor to request a replacement exam. Please keep in mind that make-up quizzes/exams are for ***unforeseen circumstances*** only, which means they will not be provided prior to the scheduled date.

Tentative Class Schedule:

August				
26	**27** Introduction: What is Chemical Engineering?	**28**	**29** History and Careers in Chemical Engineering	**30**
September				
Monday	**Tues**	**Wed**	**Thurs**	**Friday**
2	**3** Basics of Engineering Calculations	**4**	**5** Process Analysis Reading: 2.7	**6**
9	**10** Process Variables Part I Reading: 3.0 – 3.2	**11**	**12** Process Variables Part II Reading: 3.3 -3.4	**13**
16	**17** Process Classification, Basics of Material Balances Reading: 4.1, 4.2		**19** Degree-of-freedom Analysis, algorithm for problem solving	**20**

			Reading: 4.3	
23	**24** Balances on Multi-unit processes Reading: 4.4	**25**	**26** Balances on Multi-unit processes, Reading: 4.4 ***HW 1 Due***	**27**
October				
30	**1** Stoichiometry, equilibrium, multiple reactions, Reading: 4.6	**2**	**3** Balance on Reactive Systems Reading: 4.7	**4**
7	**8** Recycle reactors, combustion Reading: 4.7		**18** Single Phase systems, standard conditions, ideal gases Reading: 5.0-5.2 Recitation 4	**11**
14	**15** Non-ideal gases, Compressibility Factor, Reading: 5.3 – 5.4		**17** Multi-phase systems, gas-liquid, The Gibbs phase rule Reading: 6.1-6.2 ***HW 2 due***	**18**
21	**23** The Gibbs phase rule, one condensable component Reading 6.3	**23**	**24** **Midterm**	**25**
November				
Monday	**Tues**	**Wed**	**Thurs**	**Friday**
28	**29** Multicomponent Gas-liquid systems Reading: 6.4	**30**	**31** Solubilities of Solids in Liquids, Colligative solutions properties Reading: 6.5	**1**
4	**5** Basics of Energy Balances, Closed Systems Reading: 7.0-7.3 Recitation 6	**6**	**7** Tabulated data, Procedure for energy balances, Reading: 7.6, 8.0 –8.2 ***HW 3 due***	**8**

11	**12** ***No class – AIChE conference***		**14** ***No class – AIChE conference***	**15**
18	**19** Changes in Temperature, Heat Capacities Reading: 8.3	**20**	**21** Open systems, Reference States Reading: 7.4-7.5	**22**
25	**26** ***No class - Thanksgiving***	**27**	**28** ***No class - Thanksgiving***	**29**
December				
2	**3** Phase Change Reading 8.4	**4**	**5** Phase Change Reading 8.4 ***HW 4 due***	**6**
9	**10**	**11**	**12** ***Final Exam***	**13**