

CHEE 2331 - Chemical Processes

Catalog Data: Cr. 3. (3-0). Prerequisites: [CHEM 1332](#), [MATH 1432](#), and [PHYS 1321](#). Introduction to chemical engineering calculations, unit equations, process stoichiometry, material and energy balances, and states of matter.

Textbook: Richard M. Felder, Ronald W. Rousseau, and Lisa G. Bullard, *Elementary Principles of Chemical Processes*, Fourth Edition, John Wiley & Sons., New York, 2016.

Prerequisites by Topic:

1. Modern concepts using mathematics for understanding principles and fundamental laws of physics, chemistry, atomic and molecular structure, states of matter, equilibrium, kinetics, and elementary inorganic and organic chemistry.
2. Basic calculus of rational functions; limits, derivatives, applications of the derivatives, the definite integral with applications, mean value theorem, and basic numerical integration methods.

Topics: (Tentative, each class is 80 minutes, two classes per week)

1. Introduction to Chemical Engineering - Chapter 1 (1 class).
2. Introduction to Engineering Calculations - Chapter 2 (1 class).
3. Processes and Process Variables - Chapter 3 (2 classes).
4. Fundamentals of Material Balances - Chapter 4 (5 classes).
5. Single-Phase Systems - Chapter 5 (2 classes).
6. Multi-Phase Systems - Chapter 6 (3 classes).
7. Energy and Energy Balances - Chapter 7 (4 classes).
8. Balances on Non-Reactive Processes - Chapter 8 (5 classes).
9. Balances on Reactive Processes - Chapter 9 (5 classes).

Expected Student Outcomes:

Demonstrate ability to use units, dimensions, and data analysis. (a)¹
Demonstrate knowledge of basic process variables and how to measure them. (a)
Demonstrate ability to apply material balances to chemical engineering systems. (a)
Demonstrate ability to apply energy balances to reactive and non-reactive systems. (a)
Demonstrate knowledge of the basics of single-phase / multi-phase systems, including equilibria (a)

Letter in parenthesis refers to ABET student outcomes, Criterion 3 (see Appendix).

Instructor

- Prof. *Demetre J. Economou*
- Engineering Building 1, Room S239
- Phone: 713-743-4320
- E-mail: *Economou@uh.edu*

Office Hours of Prof. Economou

- You can drop by my office anytime, or send me an e-mail (Economou@uh.edu) to set up an appointment

Teaching Assistants

- Ryan SAWADICHAJ rsawadichai@uh.edu
- Tyler LIST tylerlistuh@gmail.com
- Tam NGUYEN tnguyen173@uh.edu

TA Office Hours

- Please contact the TA via e-mail to set up an appointment as necessary

Course Materials on Blackboard Learn

- Access Blackboard Learn at: elearning.uh.edu
- Login using the credentials of your **Cougarnet** account.

Lectures

- 1:00 - 2:30 PM, Monday - Wednesday
- Location: MH 180
- **Make-up lectures and/or exams may be held on Saturdays.**
- **Help sessions may be held on Fridays or Saturdays.**

Important Dates

- January 17, 2017: **First class**
- February 1, 2017: Last day to drop or withdraw without a grade
- March 31, 2017: Last day to drop or withdraw with a "W"
- March 13-18, 2017: Spring Break
- April 27, 2017: **Last class**
- May 3, 2017 : **Final Exam**, Wednesday 5:00 – 8:00 PM

Tentative Exam/Quiz Schedule (all exams and quizzes to take place at the regular classroom during regular class time.)

Quiz 1: 02/06/2017

Exam 1: 02/20/2017

Quiz 2: 03/08/2017

Exam 2: 03/27/2017

Quiz 3: 04/17/2017

Final Exam: May 3, 2017 (Wednesday) 5:00-8:00 PM

Basis of Grading

Homework: 0%.

Three quizzes: 24% (8% each); **closed everything.**

Two exams 40% (20% each); **closed everything.**

Comprehensive final exam 36%; closed everything.

Course Letter Grades

A: 90-100 points

B: 80-89

C: 70-79

D: 60-69

F: <60

Academic Dishonesty and Impact:

Cheating on Quizzes or Exams will earn you an F for the course, and may result in **your expulsion from the University of Houston.** Here are a few examples of cheating:

- Accessing materials that are designated for the instructor (such as the solutions manual).
- Plagiarizing the work of another student.
- Letting another student plagiarize your work.
- Plagiarizing from Wikipedia or other online references.
- **Changing answers on an Exam or Quiz, after it has been graded, and then claiming instructor error.**

The **UH Student Handbook** (<http://www.uh.edu/dos/studenthandbook/>) has more information on academic honesty.

Homework

- A set of homework problems will be provided each week.
- Homework will not be graded. Do not turn homework in.
- Solutions to a set of homework problems will be posted one week after that set is given out.
- **It is strongly recommended that you solve the homework problems on your own. Do not just read the solution.**
- If you can solve, **on your own**, the homework problems, problems we discuss in class, and example problems of the textbook, you should do very well in this class.

Lecture Guidelines

- Attendance is not mandatory, but it is **strongly recommended**.
- You must be respectful of the instructor, TA, and other students in the class. This means no conversations during class, no web surfing during class, keep your cell phone on *silent*, etc.
- Do not arrive late to class. If you are more than 5 minutes late, please do NOT enter the classroom.
- Make up lectures and/or Exams may be held on Saturdays.
- Help sessions may be held on Fridays and/or Saturdays.

Study Guidelines

- **Study** the material, **do not just read the book** like you would read a novel.
- Make sure you understand the **Educational Objectives** of each chapter of the textbook, and the **Summary** at the end of each chapter.
- Make sure you do all **TEST YOURSELF** exercises of the textbook.
- Do all **EXAMPLE** problems in the textbook.
- Do not just read the solution to a problem, Have a peak at the solution if and when you get “stuck” but eventually you should be able to solve the problem on your own.
- Study and clear-up concepts as we go; **it is strongly recommended that you study the material before the lecture. This will enhance your understanding and retention of the material.**
- **Ask questions.** All questions are valid. No question is “silly.” In fact, oftentimes, many students in the class have the same question as that asked by one of their fellow students.
- **Do not fall behind; it is difficult to catch up. The material of any given lecture depends on the material covered in all prior lectures. *It can turn into a snowball!***

- This is the first “real” engineering course and it is different from the courses you have taken so far. This course requires intense critical thinking. Homework as well as Exams and Quizzes will reflect this feature.
- This is a cornerstone course of the ChE curriculum; it demands hard work; **if you are unable or unwilling to work hard, you are strongly advised to drop the course right away.**
- **You should spend at least 10 hours per week (outside of school) on this course. If you are unable or unwilling to satisfy this time requirement, you are strongly advised to drop the course right away.**

Exam and Quiz Guidelines

- You must have a picture ID with you to participate in exams or quizzes.
- **Exams and quizzes will be closed everything. Just bring a pencil!**
- **If you miss an exam or a quiz it will count as zero.**
- Generally, exams and quizzes will be graded and returned within two weeks.
- See me for any questions regarding grading of exams or quizzes.
- **Any issues relating to a quiz or exam must be resolved within one week of the date in which the particular graded paper was returned.** I do not want anyone coming at the end of the semester with questions about their grade in a quiz or exam.

Very Important Note:

*Students must fulfill the pre-requisites (CHEM 1332, MATH 1432, and PHYS 1321) before taking CHEE 2331 (credit on your UH PS account is required). If you are missing a pre-requisite, you will be dropped from CHEE 2331 **without concern of refund or (in)ability to register in another class.***

Appendix

ABET Outcome, Criterion 3	Program-Specific Outcomes
(a) an ability to apply knowledge of mathematics, science and engineering.	<ul style="list-style-type: none"> ● Use chemistry and physics concepts to set up and solve chemical engineering problems ● Use mathematical tools to solve chemical engineering problems
(b) an ability to design and conduct experiments as well as to analyze and interpret data.	<ul style="list-style-type: none"> ● Select appropriate experimental equipment and techniques necessary to solve a given problem ● Evaluate and interpret experimental results using statistical tools
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health & safety, manufacturability, and sustainability.	<ul style="list-style-type: none"> ● Apply material and energy balance concepts to design a unit operation ● Define objectives and perform the design of an integrated chemical process under realistic constraints
(d) an ability to function on multi-disciplinary teams.	<ul style="list-style-type: none"> ● Define roles and responsibilities to align with capabilities of team members and fulfill project requirements ● Develop and carry out a project plan through team work
(e) an ability to identify, formulate and solve engineering problems.	<ul style="list-style-type: none"> ● Translate an engineering problem into a mathematical model or other suitable abstraction ● Use mathematical model or other suitable abstraction to solve an engineering problem and interpret results
(f) an understanding of professional and ethical responsibility.	<ul style="list-style-type: none"> ● Demonstrate knowledge of professional code of ethics. ● Identify ethical issues and make decisions for a chemical engineering problem.
(g) an ability to communicate effectively.	<ul style="list-style-type: none"> ● Make presentations that are factual and tailored to the audience ● Can communicate in writing to non-technical and technical audiences
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.	<ul style="list-style-type: none"> ● Understand the impact of chemical engineering solutions in a global, economic, environmental, and societal context.
(i) a recognition of the need for and an ability to engage in life-long learning.	<ul style="list-style-type: none"> ● Recognize the importance of advanced education and development opportunities ● Identify, retrieve, and organize information necessary to solve open-ended problems

(j) a knowledge of contemporary issues.	<ul style="list-style-type: none">• Know the interplay between current technical and societal issues• Know the recent history, current status, and future trends of chemical engineering
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	<ul style="list-style-type: none">• Use modern software to solve chemical engineering problems• Understand how to operate equipment relevant to chemical engineering systems