

<b>Course Prefix: CHEG</b>	<b>Course No.: 2053</b>	<b>Section No.: P01</b>	<b>Department of Chemical Engineering</b>
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Office Hours: MWF 2:30 - 4:50 p.m; WF 10 – 10:50 am

Virtual Office Hours: By Appointment

Course Location: New Electrical Engineering Bldg 117

Class Meeting Days & Times: MWF 1:00-1:50 PM

**Catalog Description:**

**(3-0) Credit 3 semester hours.** Application of the laws of conservation of mass and energy to reacting and nonreacting, simple and complex chemical systems. Application of both element and species balances to multiple reaction systems. Application of the degrees-of-freedom analysis to single process units and multi- unit process flow-sheets. Numerical solution techniques for the solution of balance equations.

**Pre-requisites:** CHEG 2043

**Co-requisites:** CHEG 2043

**Required Text:** None

**Recommended Text/Readings:**

1. Felder, R and Rousseau, R. W., Elements Principles of Chemical Processes, John Wiley and Sons Inc., 2003 or later edition
2. Himmelblau, D. M. and Riggs, J. B., Basic Principles and Calculations in Chemical Engineering: International Edition, 2003, Pearson Education, ISBN 0-13-123368-8.

**Access to Learning Resources:**

PVAMULibrary

phone: (936) 261-1500

web: <http://www.tamu.edu/pvamu/library/>

University Bookstore

phone: (936) 261-1990

web: <https://www.bkstr.com/Home/10001-10734-1?demoKey=d>

**Goals:** The goal of this course is to teach students mass and energy balance techniques.

**Outcomes:**

The student will have demonstrated the ability to:

1. Apply conservation laws.
2. Present and report basic engineering information.
3. Solve mass balances with or without chemical reactions.
4. Ability to analyze, formulate, and solve energy balances.

## Course Requirements & Evaluation Methods

This course will utilize the following instruments to determine student grades and proficiency of the learning outcomes for the course. Continuous assessment of students' homework assignments and exams will be used to evaluate their competence in CHEG Department student outcome D1 (an ability to identify, formulate, and solve fundamental engineering problems by applying principles of engineering, science, and mathematics) with the performance criteria detailed below:

**Performance criterion D1.1: Students will have the ability to apply knowledge of mathematics, science, and engineering.**

### 1. Application of conservation laws.

Students are able to:

- (i) Perform mass or mole balances on single or multiple units.
- (ii) Perform balances on batch or continuous systems.
- (iii) Determine balances for systems at steady state.

### 2. Present and report basic engineering information.

Students are able to:

- (i) Identify systems of units.
- (ii) Perform unit conversions.
- (iii) Calculate mole and mass fractions.
- (iv) Determine the total volume, average molar weight, total mass and total number of moles of a mixture.

**Performance criterion D1.2: Students will have the ability to identify, formulate, and solve fundamental engineering problems.**

### 1. Solve mass balances with or without chemical reactions.

Given a problem, the student is able to:

- (i) Solve mass balances with chemical reactions.
- (ii) Solve mass balances without chemical reactions.
- (iii) Determine the extent of reaction.
- (iv) Draw and completely label a flow chart with or without a reactor.
- (v) Determine the limiting and excess reactants
- (vi) Determine theoretical air, excess air, and relative humidity.
- (vii) Calculate stream compositions.

### 2. Ability to analyze, formulate, and solve energy balances.

Given a problem, the student is able to:

- (i) Calculate heat, enthalpy, work, and internal, kinetic, and potential energies.
- (ii) Calculate heat and enthalpy entering and leaving a unit.
- (iii) Utilize steam tables to determine vapor pressure.
- (iv) Apply and determine the latent heat of vaporization.

## Grading Policy

Item (Averages)	Weight %		Grade	Percentages
Attendance	10		A	100-90
In-class Quizzes	20		B	89-80
Homework/Project	5		C	79-70
Tests/Exams	40		D	69-60
Final Exam	25		F	59 or below

## Course Procedures

At the lecturer's discretion, additional (optional) assignments/tests may be given for extra credit.

Academic Calendar (Attached to end of syllabus - You should check online schedule for the accuracy of dates)

### **Homework Policy**

- Homework problems will be solely for practice to get students ready for the class quizzes and tests.
- Practice problems have been provided for students on the tentative lecture schedule. These problems are for your independent practice and not for weekly submission.
- Specific homework assignments will be given throughout the semester as the instructor examines the specific need of the class.
- These assignments may be computer based or involve the textbook.
- Students must submit these assignments during a given time frame.
- If a student chooses to disobey the university's honor code and copy the solution manual instead of submitting the student's own independent work, the student will receive a grade of zero on the assignment and will be referred to the department head. Such meetings must take place within a week of the infraction.

### **Exam Policy**

- Exams should be taken as scheduled. No makeup examinations will be allowed except under documented emergencies (See Student Handbook).
- Only the required and recommended supplemental texts may be used on open book exams.
- No electronic device will be allowed including iPads and eReaders.
- No graphing calculators are allowed for any test or quiz. Students must purchase a small scientific calculator to use on exams. A cell phone cannot be used as a replacement for a graphing calculator on an exam.
- Students should dress professionally and are NOT allowed to wear caps/hats in class.
- Students are NOT allowed to bring food to the classroom or eat in class.
- Any sightings of a cellular phone during an exam or a quiz will automatically result in a grade of zero for that student, and the student will be referred to the department head. Such meetings must take place within a week of the violation.

### **Class Activities And Participation Grades**

- Class activities will often occur each week.
- No late or replacement assignments will be accepted.
- These activities may be computer based or involve the textbook.
- Students must submit these assignments during a given time frame.

### **Quiz Information**

- Closed-book quizzes will be given throughout the semester. Quizzes will be based on material covered in class and homework assignments.
- A quiz can be given in class or online using Taskstream or eCourses.

### **Final Exam Procedures**

- The comprehensive final exam will have a closed book and open book section.
- All students are required to take the final exam. No exemptions are given.
- It is the student's responsibility to arrive on time for the exam with all of the needed materials.

### Tentative Lecture Schedule

Week	Lecture Topic	Suggested Homework	No. of lectures	Grading
1	Review of syllabus; Chapters 1-2	2.6, 2.9, 2.11, 2.23		
2	Chapter 3: Processes and Process Variables	3.2, 3.4, 3.7		
3	Chapter 3: Processes and Process Variables	3.10, 3.14, 3.18		
4	Chapter 3: Processes and Process Variables <b>Exam 1- Sep</b>	3.26a, 3.36		
5	Chapter 4: Fundamentals of Material Balances	4.2, 4.3, 4.6, 4.13, 4.17, 4.18a, b		
6	Chapter 4: Fundamentals of Material Balances	4.22a,b,c, 4.28, 4.55		
7	Chapter 4: Fundamentals of Material Balances	4.57, 4.67a, b		
8	Chapter 4: Fundamentals of Material Balances			
	<b>MIDTERM EXAM - Oct</b>			
9	Chapter 5: Single-Phase Systems	5.2, 5.5, 5.6		
10	Chapter 5: Single-Phase Systems	5.7, 5.10, 5.19, 5.45, 5.65		
11	Chapter 6: Multiphase Systems	6.7c, 6.14, 6.28		
12	Chapter 6: Multiphase Systems <b>Exam 3 - Nov</b>	6.64a,b,c,d, 6.69a,b		
13	Chapter 7: Energy and Energy Balances	7.9, 7.18		
14	Chapter 7: Energy and Energy Balances	7.38, 7.48		
	Application of Material and Energy Balance in Process Safety Management			
16	<b>Averages and Review for Final:</b>			
	<i>Final Exam Dec 4-10, 2019</i>			Final Exam

## **University Rules and Procedures**

### **Disability statement (See Student Handbook)**

Students with disabilities, including learning disabilities, who wish to request accommodations in class should register with the Services for Students with Disabilities (SSD) early in the semester so that appropriate arrangements may be made. In accordance with federal laws, a student requesting special accommodations must provide documentation of their disability to the SSD coordinator.

### **Academic misconduct (See Student Handbook)**

You are expected to practice academic honesty in every aspect of this course and all other courses. Make sure you are familiar with your Student Handbook, especially the section on academic misconduct. Students who engage in academic misconduct are subject to university disciplinary procedures.

### **Forms of academic dishonesty**

1. Cheating: deception in which a student misrepresents that he/she has mastered information on an academic exercise that he/she has not mastered; giving or receiving aid unauthorized by the instructor on assignments or examinations.
2. Academic misconduct: tampering with grades or taking part in obtaining or distributing any part of a scheduled test.
3. Fabrication: use of invented information or falsified research.
4. Plagiarism: unacknowledged quotation and/or paraphrase of someone else's words, ideas, or data as one's own in work submitted for credit. Failure to identify information or essays from the Internet and submitting them as one's own work also constitutes plagiarism.

### **Nonacademic misconduct (See Student Handbook)**

The university respects the rights of instructors to teach and students to learn. Maintenance of these rights requires campus conditions that do not impede their exercise. Campus behavior that interferes with either (1) the instructor's ability to conduct the class, (2) the inability of other students to profit from the instructional program, or (3) campus behavior that interferes with the rights of others will not be tolerated. An individual engaging in such disruptive behavior may be subject to disciplinary action. Such incidents will be adjudicated by the Dean of Students under nonacademic procedures.

### **Sexual misconduct (See Student Handbook)**

Sexual harassment of students and employers at Prairie View A&M University is unacceptable and will not be tolerated. Any member of the university community violating this policy will be subject to disciplinary action.

### **Attendance Policy**

Prairie View A&M University requires regular class attendance. Excessive absences will result in lowered grades. Excessive absenteeism, whether excused or unexcused, may result in a student's course grade being reduced or in assignment of a grade of "F". Absences are accumulated beginning with the first day of class.

### **Student Academic Appeals Process**

Authority and responsibility for assigning grades to students rests with the faculty. However, in those instances where students believe that miscommunication, errors, or unfairness of any kind may have adversely affected the instructor's assessment of their academic performance, the student has a right to appeal by the procedure listed in the Undergraduate Catalog and by doing so within thirty days of receiving the grade or experiencing any other problematic academic event that prompted the complaint.

Students will have up to 2 weeks to contest a grade given on an assignment during the semester. After this period, the student will not be able to contest the grade. If the student further wishes to contest a grade, the student may present the issue to the department head after meeting with the instructor during the 2-week period.

## STUDENT OUTCOMES

ABET student outcome 1 (an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics) will be assessed in this course using a number of performance criteria. The performance criteria are detailed below:

**Performance criterion 1: Students will have the ability to apply knowledge of mathematics, science, and engineering.**

### 3. Application of conservation laws.

Students are able to:

- (i) Perform mass or mole balances on single or multiple units.
- (ii) Perform balances on batch or continuous systems.
- (iii) Determine balances for systems at steady state.

### 4. Present and report basic engineering information.

Students are able to:

- (i) Identify systems of units.
- (ii) Perform unit conversions.
- (iii) Calculate mole and mass fractions.
- (iv) Determine the total volume, average molar weight, total mass and total number of moles of a mixture.

**Performance criterion 2: Students will have the ability to identify, formulate, and solve engineering problems.**

### 3. Solve mass balances with or without chemical reactions.

Given a problem, the student is able to:

- (i) Solve mass balances with chemical reactions.
- (ii) Solve mass balances without chemical reactions.
- (iii) Determine the extent of reaction.
- (iv) Draw and completely label a flow chart with or without a reactor.
- (v) Determine the limiting and excess reactants
- (vi) Determine theoretical air, excess air, and relative humidity.
- (vii) Calculate stream compositions.

### 4. Ability to analyze, formulate, and solve energy balances.

Given a problem, the student is able to:

- (i) Calculate heat, enthalpy, work, and internal, kinetic, and potential energies.
- (ii) Calculate heat and enthalpy entering and leaving a unit.
- (iii) Utilize steam tables to determine vapor pressure.
- (iv) Apply and determine the latent heat of vaporization.