Course Title: Material and Energy Balances
Course Prefix: CHEG Course No.: 2053 Section No.: P01

Department of Chemical Engineering College of Engineering

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P.O. Box 519
Mail Stop 2505
Prairie View, TX 77446-0519

Office Hours: TR 12:00 PM - 1:30 PM;
Virtual Office Hours:

Course Location: New Electrical Engr Bldg 115

Class Meeting Days & Times: TR 2:00 – 3:20 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.

Prerequisite: CHEG 2043
Co-requisites: CHEG 2043

Required Text: None

Recommended Text/Readings:

Access to Learning Resources:
PVAMU Library:
phone: (936) 261-1500;
web: http://www.tamu.edu/pvamu/library/
University Bookstore:
Goals: The goal of this course is to teach students mass and energy balance techniques.

GRADING POLICY

<table>
<thead>
<tr>
<th>Item (Averages)</th>
<th>Weigh (%)</th>
<th>Grade</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attendance</td>
<td>10</td>
<td>A =</td>
<td>100 - 90</td>
</tr>
<tr>
<td>Homework/Project</td>
<td>40-45</td>
<td>B =</td>
<td>89 - 80</td>
</tr>
<tr>
<td>Test/Exams</td>
<td>20-25</td>
<td>C =</td>
<td>79 - 70</td>
</tr>
<tr>
<td>Final Exam</td>
<td>25</td>
<td>D =</td>
<td>69 - 60</td>
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<td>F =</td>
<td>59 or below</td>
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</table>
TESTING POLICY AND PROCEDURES

- Tests will occur in class and will consist of closed and open book portions.
- NO MAKE-UP EXAMS WILL BE GIVEN. A missed exam due to an excusable absence will not be added into the students Test Average; therefore, only three tests will count for that student. Only the hardcopy edition of the text may be used on open book exams. NO EXCEPTIONS!
- 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 use as a replacement for a graphing calculator on an exam.
- No bathroom breaks are allowed during a test or a quiz. If a student leaves the room during this time, their exam/quiz will be collected and considered finished by the student.
- 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.

HOMEWORK ASSIGNMENTS AND GRADES

- 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.

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 timeframe.

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

“An ability to identify, formulate, and solve complex/fundamental engineering problems by applying principles of engineering, science, and mathematics.”

Assignments that test competency in this area will include problems that test a student’s ability to solve complex engineering problem using appropriate engineering and mathematical principles acquired in the first few years of studies.

Complex/fundamental engineering problems (CEP)/(FEP) are engineering problems having one or more of the seven characteristics below:

i. wide-ranging or conflicting technical issues,
ii. having no obvious solution, addressing
iii. problems not encompassed by current standards and codes
iv. involving diverse groups of stakeholders
v. including many component parts or sub-problems
vi. involving multiple disciplines, or
vii. having significant consequences in a range of contexts

1. Identify and Formulate engineering/technical/computing problems using principles of engineering/mathematics/science

Given a complex engineering problem, the students are able to:

i. Understand the given problem and identify the subject area and concepts involved.
ii. Convert the problem into a well labeled sketch (such as free body diagram, flow chart, functional block diagram, schematic diagram).
   a. functional block diagram, schematic diagram).
iii. Formulate the CEP/FEP into a mathematical model [using basic, intermediate and advanced mathematics ranging from algebra & trigonometry, calculus, probability & statistics, complex analysis to Fourier transform & LaPlace transforms] or experimental framework stating all relevant assumptions.
iv. Formulate the CEP/FEP into an engineering model [using relevant laws and equations from engineering and science areas) stating all relevant assumptions.

2. Solve CEP/FEP computing problems

Given a CEP/FEP that has been formulated, students are able to:

i. Solve the resulting engineering/mathematical/science formulations analytically, numerically, experimentally or through the use of appropriate software or computer program.
ii. Evaluate and interpret the result.