ChE 201 – Material and Energy Balances

Fall 2025

WELCOME

I would like to welcome you to the ChE 201 "*Material and Energy Balances*" course. During the semester, we will learn the basics of process calculations that are the fundamentals of our discipline.

As you read this document for the first time, the amount of the material to be covered and the topics may sound overwhelming and alien. I assure you that, working together, we will successfully go through the course and meet its objectives.

I am excited about the opportunity to work with you and I have no doubt I will be learning from you and you will be learning from me.

INSTRUCTOR

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I have been at NJIT for over forty years and have served in a number of academic and administrative positions. Teaching is one of my strong passions and I cannot wait to meet and work with you.

TEACHING ASSISTANTS

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CHARACTERISTICS OF THE COURSE

COURSE DESCRIPTION

This course covers the basic principles of material and energy balances for a variety of chemical engineering systems. Basic unit operations and simple designs of chemical processes are introduced.

PREREQUISITES

CHEM 126 and MATH 112 or equivalent.

CO-REQUISITES

ChE 101 and ChE 230

STUDENT OUTCOMES

At the end of the course, students will be able to:

1. Perform material balance calculations: a.) Draw and label process flowcharts from verbal process descriptions; b.) Carry out degree-of-freedom analysis; c.) Write and solve material balance equations for single-unit and multiple-unit processes, processes with recycle and bypass, and reactive processes
2. Write and solve material balance equations for single phase systems and multi-phase systems for steady-state processes with and without reactions
3. Write and solve energy balance equations based on the 1st law of thermodynamics for steady-state processes with and without phase changes or reactions
4. Derive and solve steady-state and transient material and energy balance equations for chemical processes

Any student registered for the class has the qualifications needed to succeed in it. Even if you have forgotten parts of the prerequisite knowledge, we will review essential information together when needed, and I will guide you to review things on your own as well.

Work-Learn-Succeed together, will be the motto for this class.

MEETING TIMES AND VENUES

CLASS

We will be meeting on Mondays from 8:30 AM to 11:20 AM and on Wednesdays from 8:30 AM to 10:35 AM. Both meetings will be held in Room 209 Kupfrian Hall.

Although attending class will not significantly affect your grade in the course, extensive research shows a very strong correlation between class attendance and success in any course. I will do my best to create a class environment such that no one would like to miss any meeting.

DISCUSSIONS BEYOND CLASS

Since my office is too small to accommodate visitors, I will be sitting every Tuesday and every Wednesday from 11:30 AM to 12:30 PM in 373 Tiernan Hall and waiting to see any one of you, either individually or in

groups that you arrange. You may want to see me to introduce yourself, get to know me better, help me get to know you, develop or sharpen your study skills, go deeper into the course material, get help with content or assignments of the course, or, if you think I can be of help, talk about your studies and plans in general.

In case your class schedule or other responsibilities do not allow you to come on the days and times mentioned above, please feel free to e-mail me whenever you want us to meet and I will be doing my best to find a mutually agreeable day and time.

TEXTBOOK AND OTHER RESOURCES

We will be using "Elementary Principles of Chemical Processes," by R.M. Felder, R.W. Rousseau, and L.G. Bullard, 4th edition, Willey (2016). ISBN-13: 978-0-470-61629-1.

I understand that the cost of textbooks is substantial and thus, I recommend either renting the textbook of this course or sharing it with a classmate.

You will need a scientific or graphing calculator to perform calculations.

COURSE LOGISTICS AND REQUIREMENTS

IN-CLASS WORK

We will be using an instructor-students interaction mode in class. Students will be members of groups and will be working as teams on various activities. Some of the activities will not be graded (will help with formative assessment) while others will be graded (summative assessment). The dates of graded in-class activities will not be announced ahead of time but they will be usually held on Wednesdays.

HOMEWORK

Extensive research shows that practicing the knowledge and skills one acquires helps with better understanding the material and ensuring they have met the course outcomes. For this reason, homework problems will be assigned and graded. From every homework set, one problem will be graded to a maximum of 10 points. For the remaining problems you will be earning 1 point for attempting them. The problems will be generated by the instructor. This will help you get familiar with my style of writing problems and framing questions and thus, it will help you when you take

an exam. On the day you turn is a homework set and if no exam is scheduled on that day, there will be a quiz having either a problem from the homework set you just turned in or something very similar to one of the problems. This will ensure you have tried and understood the problems.

EXAMS

FINAL EXAM

The final exam will take place on the date and time that will be announced by the Registrar's Office soon.

EXAMS DURING THE SEMESTER

There will be three exams during the semester. They will take place in class on the following dates:

Exam 1: Wednesday, October 1, 2025
Exam 2: Wednesday, October 29, 2025
Exam 3: Wednesday, December 3, 2025

MAKE-UP EXAM

For those students who will be entitled to take a make-up exam (please see section "Structure" below), it will be held on the Reading Day (December 12, 2025) at a time and place to be announced later.

COURSE STRUCTURE

The key to success for any team, group of people, or organization is the existence of a structure that supports and guides their activities. This structure is described by some rules (policies) but is also based on (at least a few) fundamental assumptions. Following is a description of the structure for this course.

FUNDAMENTAL PRINCIPLES

My fundamental principles for this course are:
I am here to facilitate your learning and help you succeed.
I have high respect for each and every one of you.
I expect you will be treating all members of our group with respect.
I believe you are here because you want to learn and succeed.
I am convinced you can succeed regardless of hurdles.
I believe you are grown-ups and behave like young (trainee)

professionals.
I take it for granted you will behave according to the university code of conduct and academic integrity and that you can always refresh your memory on these matters by going to the university catalog as well as to the university website
www.njit.edu/dos/sites/njit.edu.dos/files/NJIT%20University%20Policy%20on%20Academic%20Integrity_0.pdf
I value your time and material expenses for this course (and your education in general) and empathize with all difficulties you encounter. I expect you do the same towards all members of our group.
I believe each member of our group brings positive things that will help all members grow to a level of better professionals and human beings.
Our learning and actions in this course will have positive consequences for the societal good.
I will be providing accommodations when contacted by the OARS office.

CLASSROOM POLICES

In class, we will be sitting with our teammates.
We should be arriving for class on time.
If we are late or need to leave class early, we should be entering or leaving the classroom in a non-disruptive way.
If we arrive for class late and a graded in-class activity has started, we will have to wait until the activity ends before we enter. We will not be earning credit for an activity we missed for any reason.
To help us focus on the course, we will not be using our cell phones in class; we will turn them to silent mode and put them aside.
We will be able to use calculators in class (including during exams), but we will not use the calculator function on our smart phone.
We will not be providing an answer to a question asked, or making a comment unless we have permission to address the class.
We can use our computer in class to keep notes and record (voice only) discussion, but we will not be using it for purposes unrelated to this course.

GROUP ACTIVITY POLICIES

For any group activity, we will strive to contribute our best to the team effort. We will have the opportunity to evaluate both our teammates and ourselves for their efforts and contributions; completing these evaluations is not optional. These evaluations will help the instructor differentiate (adjust) the grade each student earns from a group activity; in other words, not all teammates will be necessarily getting the same grade for a group activity.

If we have issues with our teammates, we will be bringing them to the attention of the instructor as soon as possible.

If we have difficulties working in a group, we will be discussing it with the appropriate university office (OARS) and, if approved, we will be getting an accommodation.

HOMEWORK POLICIES

Homework is designed to help prove to ourselves that we have understood the course material. Although it is meant to be an individual activity, we can work with classmates but what we submit must be something we understand and "own."

We will be turning in hard copies of our homework solutions in class on the day a homework set is due.

If we have to miss class on a day a homework set is due, we should be e-mailing it to the instructor before the end of class meeting of that day.

The instructor will be posting solutions to the homework problems immediately after the class meeting. For this reason, submissions after the end of class (hard or soft copies) will not be accepted.

EXAM POLICIES

During any exam, we will be able to use a calculator and two sheets (8.5'' X 11", double sided) of personal notes. We will be turning in the notes with the exam booklets. The instructor will be providing the examination booklets.

The instructor will be grading exams and returning them in class at most a week after the exam takes place.

The instructor will be reporting to the Office of the Dean of Students any violation of the academic integrity code observed during the exam or reasonably suspected during grading of the exams.

A student may miss only one (other than the final) exam and take a make-up exam instead. There must be a health or other serious reason for missing an exam and when it happens, the instructor must be notified no later than the day of the exam. The student should be working with the Office of the Dean of Students (DOS@njit.edu) on this issue. If DOS finds the reasons legitimate, the instructor will be notified and the student will be entitled to take the make-up exam.

The make-up exam will be comprehensive and will be administered on December 12, 2025 (Reading Day) at a location and time to be announced later.

If a student misses two exams, even if both are for reasons approved by DOS, the score for one of them will be zero (the lowest grade on the exams will be dropped anyway; see below).

The final exam will be based on the entire course material (comprehensive). A student missing the final exam without a DOS-approved reason earns a zero on it. A student missing the final exam with a DOS-approved reason gets an Incomplete for the course.

DETERMINATION OF COURSE GRADE

The numerical overall score for the performance in the course will be calculated as follows:

Final Exam	250 points	(25%)
Best score in Exams 1, 2, and 3 multiplied by 2	300 points	(30%)
Second best score in Exams 1, 2, and 3	150 points	(15%)
The average score of in-class activities normalized to 100 points after dropping the lowest score	100 points	(10%)
The average score in homework problems normalized to 100 points after dropping the five lowest scores in individual problems	100 points	(10%)
The average score in quizzes after dropping the two Lowest scores normalized to 100 points	100 points	(10%)

As you can see from the above, there are multiple opportunities to recover from a bad performance on an exam or group activity or some homework problems. The idea here is that we all may suffer a failure but everyone working seriously on something (e.g., on a course) deserves opportunities to recover. The issue here is for you making sure you do not “plan on recovery.” What I mean is, do not come to an exam unprepared banking on the fact that the next one will be better. Always and for any activity, try your very best!

Based on the foregoing, the maximum numerical score for the course is 1,000 points. Based on the numerical score, letter grades will be assigned as follows:

A	900 points or higher
B+	850 – 899 points
B	800 – 849 points
C+	750 – 799 points
C	700 – 749 points
D	600 – 699 points
F	599 points or less

As you can see, there is no curving of grades and there is no competition for grades. The ideal and the target should be for all students to score at least 900 points and thus, all get an A. Let us all set this target and work for it!
Getting close to the ideal goal will be a great individual and team success!
Good luck!