

Fall 2021

CHE 210-003: Chemical Process Calculations I

Richard Cimino

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CHE-210-Chemical Process Calculations I – S003- F21

Instructor: Dr. Richard T. Cimino, Senior Lecturer

Office: 376 Tiernan Hall, Phone: 973-596-5729, E-mail: cimino@njit.edu

Class: M 2:30-3:40 PM, Th, 1-2:20 PM; Face-to-Face

Room: Please check the NJIT Course Schedule for room

<https://uisnetpr01.njit.edu/courseschedule/>

Office Hours: By arrangement only - please sign up online at <https://drcimino.youcanbook.me>

Office hours this semester will take place using my personal WebEx room:
njit.webex.edu/meet/ciminonjit.edu

Course Description and Requirements

Analysis of chemical processes is introduced, emphasizing steady and unsteady-state mass and species balances. This course uses primarily chemistry and algebra to determine, for a wide variety of processes and applications, the flow and concentrations of different chemical species.

Prerequisites: Chem 126, Math 112

Corequisites: CS 115

Course Objectives

Taking this course, a motivated student will learn to:

1. Apply basic chemistry and engineering concepts to thermodynamic systems
Perform basic engineering calculations.
2. Convert quantities from one set of units to another quickly and accurately
3. Define, calculate, and estimate properties of process materials including fluid density, flow rate, chemical composition variables (mass and mole fraction, concentration), fluid pressure, and temperature
4. Perform material balance calculations:
 - a. Draw and label process flowcharts from verbal process descriptions;
 - b. Carry out degree-of-freedom analyses
 - c. Write and solve material balance equations for single-unit and multiple-unit processes, processes with recycle and bypass, and reactive processes
5. Perform applied physical chemistry calculations:
 - a. Use basic equations of state to calculate molar flow rates based on data for volumetric flow rate, temperature and pressure

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- b. Calculate the partial pressure of a constituent of a gas mixture
- 6. Use spreadsheets (Excel) to solve problems
- 7. Begin to understand the importance of safety issues
- 8. Become aware and start evaluating potential safety hazards in processes, in particular, chemical processes
- 9. Work in problem-solving teams

Learning Materials

Textbook

Required: Elementary Principles of Chemical Processes, 4th Ed., R. M. Felder, R. W. Rousseau & L. G. Bullard, Wiley, (2016). ISBN: 0470616296. The textbook is the main source for preparing for classes and reading the textbook before each class is necessary. Additional materials will be posted on Canvas.

Calculator: A high-end calculator (TI-83, TI-84 or TI-84SE) is required for solving numerical problems.

Required Software: MS Excel, MS Word

Additional Materials: Engineering Pad paper (can be obtained in the Campus Bookstore or online)

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Course Outline

Week	Date	Topic (preliminary, subject to minor changes)
1	9/2-8*	Ch.1, Ch. 2.1-3; *9/8 is a Wednesday!
2	9/9-13	Ch. 2.4-2.6
3	9/16-20	Ch. 3.1-2, Ch. 3.3-4
4	9/23-27	Ch. 3.4-5, Exam 1 Review
5	9/30, 10/4	Exam 1, Ch. 2.5
6	10/7-11	Ch. 2.7, Team Project Introduction
7	10/14-18	Ch. 4.1-3
8	10/21-25	Ch. 4.3-4
9	10/28-11/1	Exam 2 Review, Exam 2
10	11/4-8	Ch. 4.5, Ch. 4.6
11	11/11-15	Ch. 4.6-7
12	11/18-23	Ch. 4.7
13	11/30-12/2	Ch. 10.1-2
14	12/6-9	Final Exam Review

Important Dates

Add/Drop: Sep 8 2021

Midterm exam #1: Sep 30, 2021

Midterm exam #2: Nov 1, 2021

Withdraw Deadline: Nov. 10, 2021

Final Exam: Week of Dec. 13, 2021

Assessment and Grading

Homework: Homework assignments will be posted weekly on Canvas. Homework assignments are due one week after they are assigned and must be submitted electronically on Canvas. No late homework will be accepted. Students must submit homework individually. Homework must follow the Engineering Homework Format (see Canvas for Details). Assignments that do not conform to the Engineering Homework Format will receive an automatic deduction of 10 points.

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Team Assignments & Project: Other assignments will require you to work in teams. The instructor will designate the teams.

Peer Evaluation: You will use the Comprehensive Assessment of Team Effectiveness (CATME, www.catme.org) to evaluate the teaming behaviors of yourself and your teammates. These evaluations will be incorporated into the assignment of final grades.

Quizzes: Regular quizzes will be given based on the weekly reading material, including both concepts and problems. The quizzes will be administered asynchronously using Canvas. No make-up quizzes will be allowed. All quizzes will be closed book with no material allowed.

Exams: There will be three exams: 2 Midterms (80 min) and 1 Final, both (2.5 hours). All exams will be open book/open note.

Grading: Your final course grade will be calculated by weighted average, using the following weights:

Category	Weight
Homework	10%
Quizzes	15%
Project	5%
Midterms (x2)	40%
Final Exam	30%
Total	100%

Final course grades will be assigned according to the following rubric:

Lower Bound	Letter Grade	Upper Bound
90	A	100
85	B+	89
80	B	84
75	C+	79
70	C	74
60	D/F*	69
0	F	59

Note: Students in the D/F numerical range will only receive a "D" if I am confident that they will be able to handle the second half of the course successfully (CHE-240). I reserve the right to give students in this range an F if they have not shown adequate preparation for future coursework. Most often, this determination comes down to the individual student's performance on Quizzes and Exams.

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Policies

NJIT Honor Code: The NJIT Honor Code will be upheld and any violations will be brought to the immediate attention of the Dean of Students.

Special Needs: If you need accommodations due to a disability please contact Chantonette Lyles, Associate Director of Disability Support Services, Fenster Hall Room 260 to discuss your specific needs. A Letter of Accommodation Eligibility from the Disability Support Services office authorizing your accommodations will be required.

Lectures

This course is a face-to-face course. This means that each lecture will take place in-person during the class hours. Attending the sessions is mandatory. Failure to attend the sessions may result in being marked as "unattended" for the course, which may negatively impact your financial aid status. Additionally, the examples discussed in the class are not necessarily from the main textbook and therefore missing a class will have consequences for your preparation for quizzes and exams. *Note, if at any point the course is forced to go converged or completely online due to COVID-19, you will be provided with additional information on how to access the course lectures.*

Students are expected to be *seated and ready to learn* in the classroom by the class start-time. Being late to class may have consequences for your final course grade.

No audio or video recording is allowed. All sessions will be automatically recorded for you to review at a later date.

Cellphones should be turned off during both lectures and exams and not allowed under any circumstances.

Course materials, office hours and correspondence

The course Canvas page is the main platform for delivering information about the course. All relevant course materials and assignments will be posted on Canvas, so a student should check it regularly.

Students must upload a professional-looking head shot for their Canvas profile.

Students are strongly encouraged to attend Office Hours. Long questions which require derivations will be discussed only during the Office Hours and will not be answered by email. Questions regarding grades can be discussed only during the Office Hours.

E-mail and Canvas correspondence is intended only for quick questions. Questions which require a detailed discussion should be discussed in person during the Office Hours.

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All correspondence should be conducted in a professional style, using formal English.

To assure a quick response to your emails, please add "ChE210" in the subject of your emails.

The instructor reserves the right not to respond to emails at his discretion.

Exams, Quizzes, Homework and Grades

A letter grade is based on the final score, calculated using Canvas in accordance with the Tables given in this syllabus. The assigned letter grade is final and cannot be negotiated.

A student can dispute the exam scores within a week after the announcement of the score. Exam scores can only be disputed during the official Office Hours, not during class time or via email.

Students will get zero for not coming to quizzes, exams, or any other course activity. If students miss an exam due to extreme circumstances (such as a medical problem), they need to notify the instructor via email before the beginning of the exam, and bring proof of the circumstance to the Dean of Student's office. Only in the case of official approval from the Dean of Student's office, may a make-up be given at the discretion of the instructor.

A student must show full details when solving a problem during an exam or a quiz. Not showing the work will cause the losing points even if the final answer is correct.

Partial credit can be given for solving the exam and quiz problems, though no partial credit will be given if there are not enough details to follow.

The final answer should be always evaluated with respect to its reasonability. No partial credit will be given if the final answer is wrong and unreasonable, and it is not stated.

If a student misses a quiz due to a legitimate reason (absence approved by the Dean of Students), this quiz is excluded from the quiz average calculation.

Student handwriting must be legible in order to receive points.