

Website: sakai.rutgers.edu
Lectures: Tu, F 8:40–10:00 am, BME 102
Instructor: Professor Helen M. Buettner
 Engineering Building, Rm C-228
 Email: helen.buettner@rutgers.edu
 Office Hours: Tu & F, 10-11am, and by appointment.

Teaching Assistant:

Nanxia Zhao
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 Online: Thursday, 3:30-5 pm

Learning Assistants: *Lecture:* Matthew Henderson, Carolina Radecki, Alina Thokkadam
Study Group: Isaiah Chen

Course Description: Chemical Engineering Analysis I introduces concepts and methods fundamental to subsequent courses in the chemical engineering major and to the practicing chemical engineer. We will focus on two key principles: 1) the conservation of mass, and 2) the conservation of energy. Application of these two principles is essential in the design and analysis of chemical engineering systems. We will first consider basic units, variables and conceptual representations used to describe chemical processes, and then apply the conservation of mass to chemical systems in the form of mass balances. The study of mass balances will include systems in which chemical reactions are occurring as well as systems containing multiple phases (gas, liquid) at thermodynamic equilibrium. Finally, we will incorporate the conservation of energy in the form of energy balances to analyze chemical systems undergoing heating and/or phase change.

Course Objectives:

1. Develop the ability to identify and solve chemical engineering problems based on written information.
2. Understand and use process flowcharts in problem solving.
3. Understand, derive and solve steady-state material and energy balance equations.
4. Apply the following concepts within the context of material and energy balance problems:
 - Degrees of freedom
 - Reactive systems – limiting and excess reactants, fractional conversion, extent of reaction, yield and selectivity, combustion
 - Single-component phase equilibrium – vapor pressure, boiling point, triple point
 - Gas-liquid systems – Raoult’s Law, Henry’s Law, saturation, humidity, phase diagrams, bubble/dew points
 - Thermodynamic concepts – enthalpy, heat capacity, internal energy, adiabatic, isothermal, latent heat

Assessment:**Grading Distribution**

zyBook Reading Activities	10%	①	Must score 60% or better on each of these to pass the course.
Homework (Sapling):	10%		
In-Class Exercises (iClicker):	15%		
Midterm Exam 1:	20%	②	Must average 60% or better on exams to pass the course.
Midterm Exam 2:	20%		

Final Exam:	25%
TOTAL	100%

Educational Materials and Technology:

Textbooks:

Required:

zyBook

14:155:201: Chemical Engineering Analysis
I
Fall 2017

To purchase access:

1. Sign in or create an account at learn.zybooks.com
2. Enter zyBook code

RUTGERS14155201BuettnerFall2017

3. Subscribe

A subscription is **\$48** and will last until Jan 04, 2018.

Recommended:

Felder, R.M., Rousseau, R.W., Bullard, L.G. 2015. **Elementary Principles of Chemical Processes, 4th Ed.** John Wiley & Sons, NY.

Calculator:

A **nonprogrammable** scientific calculator will be required for exams (< \$10).

iClicker:

You will need an iClicker remote device for in-class exercises. We will be using the iClicker during most lectures. Your use of the iClickers will be graded, and credit will only be given if you have registered your iClicker at the time of the lecture. (Note: the brand name is iClicker – **no other clicker will work in this course**).

Either an iClicker+ or an iClicker 2 device will work. You can use the same iClicker device for more than one class. **However, you cannot use more than one iClicker for this course.** The iClicker is available from the Rutgers Bookstore and other stores. You can also buy a used iClicker. **You cannot share the same iClicker with another student** (even somebody who would use it in another class) because the unique ID built into the device must be associated with only one name.

Before using your iClicker in class, you will need to register it. You can register it on Sakai or at iClicker.com. It is a good idea to copy your iClicker id number and keep it in a safe place in case it wears off the iClicker back. If you lose your clicker and get another, you must register again.

Sapling Learning Online:

You will need to purchase access to Sapling Learning Online Homework (\$45):

Go to www.saplinglearning.com/login to log in or create an account. The following link includes detailed instructions on how to register for a course: <https://community.macmillan.com/docs/DOC-5972-sapling->

[learning-registering-for-courses](#). The course is listed as: 'Rutgers University, Busch - CHEME 201 - Fall17 - BUETTNER'.

If you have any issues during sign up or throughout the semester technical support can be reached by phone or by webform via the Student Support Community. The following link provides detailed hours and information. <https://community.macmillan.com/docs/DOC-6915-students-still-need-help>

Instructional Videos:

Brief instructional videos will be assigned to complement textbook readings. These videos are selected from the screencast library developed for this course at UC-Boulder. Additional videos are available if you are interested in browsing them (<http://www.learncheme.com/screencasts/mass-energy-balances>), but only the assigned videos are required.

Course Policies

Class Attendance

You are expected to attend class, be on time, and behave in a considerate manner. If you miss class, it is YOUR RESPONSIBILITY to make up the work. The instructor will not provide individual updates or an individual review of the material. If you miss something that is not posted on Sakai, you must get it from another student.

Instructor Announcements

Announcements are frequently made both in-class and outside of class. Announcements made outside of class will be posted to the Sakai course site and/or distributed by email. You are expected to check Sakai and your email frequently and keep up to date on announcements made between class meetings.

Email Address

Your email address serves as a unique identifier for multiple purposes in this course (e.g., Sakai gradebook, iClicker, Sapling Learning, course announcements). The email address used in all cases will be your official Rutgers email address provided to me on the course roster. (In most cases, this is your Rutgers Personalized Email Address.) You will need to use this address as a login ID in some cases, and email will be sent to this address. If you wish to receive email at a different address, you must link that address to the one I have by using the Rutgers email management system located at: 'netid.rutgers.edu' It is your responsibility to ensure that your email account is correctly linked and that you are receiving all email communications for the course.

Assigned Reading and Videos

Reading and video assignments will be listed on assignment sheets posted in Sakai>>Resources>>Daily Assignments. It is important that you complete these assignments prior to the class indicated since they will serve as the basis for class discussion and in-class exercises that day. If you do not complete the assignments prior to class, it will be difficult to grasp the discussion and do the exercises.

zyBook Reading Activities

zyBook reading activities are embedded in the reading assignments. Both Practice Activities and Challenge Activities will be assigned and will be graded. Activities must be completed by class time on the due date to receive credit.

Sapling Homework

Sapling online homework will be posted on the Sapling course site each week approximately two weeks before the due date. Homework must be submitted by **5:00 am** on the due date. Late homework will not be accepted. Assigned homework will be listed on the assignment sheets posted on Sakai, but if there is no assignment sheet for a given day, you must still check the Sapling Learning course site for assigned homework.

Exams

Exams will be closed book and closed notes. Exam problems will be similar to homework problems. Only nonprogrammable scientific calculators will be permitted for exams. All backpacks and personal items must be placed at the front of the room prior to the start of the exam. The only items permitted at your desk will be two pencils and a calculator. Seating for exams will be assigned. You are expected to arrive for the exam by 8:25 a.m. to get your seat assignment, stow your personal items, and find your seat.

In-Class (Clicker) Exercises

Most lecture periods will include several in-class exercises that will be completed in small groups and answered using iClickers. These will be graded, with 50% of the points for each question awarded for participation and 50% for correctness. There will be no makeup for in-class exercises. However, your two days of lowest scores will be dropped from the grade calculation. In the case of an excused absence, your score for in-class exercises will be based on the remaining exercises.

Excused Absence from Class

Attendance in class is important and expected. Absence from class may be excused under certain circumstances. However, students are responsible for discussing arrangements to make up any missed work **PRIOR** to their absence whenever possible. Examples of situations that may warrant an excused absence include:

- Certified medical excuse
- Required active military duty, as certified by the student's commanding officer
- Religious observance
- Participation in an official university function (e.g., member of a university athletic team), as certified by the appropriate university official.

Excused absences require a letter from the Dean for Academic Services (EN-B100). Students having an illness, conflict due to a religious observance, death in the family, or other situation that affects their ability to attend class, take exams, or complete assignments should bring documentation (i.e., doctor's note, obituary, certification letter) to the Office of Academic Affairs (EN-B100) for an Excused Absence letter, and then bring that letter to the instructor.

Make Up Exam

One make up exam will be offered to students missing a midterm exam due to an excused absence. The make up exam will be cumulative (through the second exam) and will be scheduled during the 14th week of class.

Re-grading

Exams will be graded by the instructor, TA, and course grader. If you believe that an error has been made in grading your work, explain your reasoning **in writing** and submit to the instructor for review **within one week** from the date the graded work is returned to you.

Special Needs

In compliance with Rutgers University policy and equal access laws, appropriate academic accommodations can be made for students eligible for such support. Students are encouraged to register with the Office of Disability Services to verify their eligibility for appropriate accommodations. Please speak with me about any requests for academic accommodations or other concerns as early in the semester as possible.

Ethics & Academic Integrity

- It is understood that a student's name on any individual homework assignment or exam indicates that he/she neither gave nor received unauthorized aid.
- Unless otherwise instructed, all class work that receives a grade is to be done individually.

- A student's name on a group assignment indicates that he/she contributed to the assignment. Placing a student's name on an assignment to which he/she did not contribute is a violation of academic integrity.
- Exams are tests of individual performance. The student is not permitted to obtain assistance from any other person during an exam. The student must adhere strictly to the instructions provided by the professor regarding what is permissible to be used during the exam.
- Disciplinary actions for academic misconduct will be in accord with the University policy on academic integrity.
- Students are expected to familiarize themselves with and adhere to the University policy on academic integrity at: <http://academicintegrity.rutgers.edu/integrity.shtml>.

ABET Outcomes and Assessment

The Rutgers program in chemical engineering is accredited by the Accreditation Board for Engineering and Technology (ABET), which ensures that each course meets professional criteria.

Program outcomes achieved in this course

- (a) an ability to apply knowledge of mathematics, science and engineering;
- (e) an ability to identify, formulate, and solve engineering problems; and
- (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

The achievement of outcomes (a), (e), and (k) will be assessed in this course as follows:

Outcome (a): an ability to apply knowledge of mathematics, science and engineering

Exams – Homework: Most of the problems test the ability to apply knowledge of mathematics, science and engineering in problem solving

Outcome (e): an ability to identify, formulate, and solve engineering problems.

Homework – The problems will require the formulation of the problem described, identification of the main challenges, investigation of multiple solution approaches, report of the alternatives.

Outcome (k): an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Homework assignments will require the use of Excel and/or Matlab as software to perform calculations. The evaluation of the use of this tool will be tabulated for the whole class and additional sessions will be scheduled as appropriate.

Week	Date	Topic
1	Sep 5	Intro, Syllabus, Course Policies & Procedures
	Sep 8	Engineering Calculations
2	Sep 12	Processes & Process Variables
	Sep 15	Fundamentals of Material Balances
3	Sep 19	Degrees of Freedom
	Sep 22	Material Balances: Single-Unit Processes
4	Sep 26	Material Balances: Multiple-Unit Processes
	Sep 29	Material Balances: Multiple-Unit Processes
5	Oct 3	Material Balances: Reactive Systems
	Oct 6	Material Balances: Reactive Systems
6	Oct 10	Material Balances: Reactive & Combustion Systems + Review
	Oct 13	Exam I
7	Oct 17	Material Balances: Reactive & Combustion Systems
	Oct 20	Single-Phase Systems: Ideal Gases
8	Oct 24	Multiphase Systems: Single Component Gas-Liquid
	Oct 27	Multiphase Systems: Single Component Gas-Liquid
	<i>Oct 30</i>	<i>Last day to drop a class with a 'W' via WebReg</i>
9	Oct 31	Multiphase Systems: Multicomponent Gas-Liquid
	Nov 3	Multiphase Systems: Multicomponent Gas-Liquid
10	Nov 7	Multiphase Systems: Multicomponent Gas-Liquid + Review
	Nov 10	Exam II
	<i>Nov 13</i>	<i>Last day to drop an SOE class with Dean's permission</i>
11	Nov 14	Fundamentals of Energy Balances
	Nov 17	Energy Balances: Thermodynamic Data Tables
12	Nov 21	NO CLASS (Thursday classes this day)
	Nov 24	NO CLASS – HAPPY THANKSGIVING
13	Nov 27	Energy Balances: Steam Tables
	Dec 1	Energy Balances on Nonreactive Processes
14	Dec 5	Energy Balances: Single-Phase, Nonreactive Systems
	Dec 8	Energy Balances: Phase Change Operations
15	Dec 12	Review
16	Dec 19	FINAL EXAM (8:00 – 11:00 am)

** The instructor reserves the right to modify the schedule as necessary.*

Academic Policies and Student Support

Academic Integrity

115 College Avenue, New Brunswick | (848) 932-9414 | academicintegrity.rutgers.edu

Academic integrity is essential to the success of the University's educational and research missions, and violations of academic integrity constitute serious offenses against the entire academic community. The principles of academic integrity require that a student:

- Properly acknowledge and cite all use of the ideas, results, or words of others.
- Properly acknowledge all contributors to a given piece of work.
- Make sure that all work submitted as his or her own in a course or other academic activity is produced without the aid of impermissible materials or impermissible collaboration.
- Obtain all data or results by ethical means and report them accurately without suppressing any results inconsistent with his or her interpretation or conclusions.
- Treat all other students in an ethical manner, respecting their integrity and right to pursue their educational goals without interference. This requires that a student neither facilitate academic dishonesty by others nor obstruct their academic progress.
- Uphold the canons of the ethical or professional code of the profession for which he or she is preparing.

Rutgers University is committed to fostering an intellectual and ethical environment based on the principles of academic integrity. Every member of the University community bears a responsibility for ensuring that the highest standards of academic integrity are upheld.

Student Advising

General Advising: Office of Academic Services

Engineering B100, Busch Campus | (848) 445-2212 | soe.rutgers.edu/oas

Undergraduate advisors and deans are available to you at the School of Engineering to assist you with inquiries related to course planning, academic policies, professional development, scholastic standing, degree progress, withdrawal options, and more. Please visit soe.rutgers.edu/oas/advising for work-in and advising hours,

Advising in Major: Engineering Departments

Busch Campus | soe.rutgers.edu/deptadvising

The Undergraduate Directors in the engineering, math, and science departments are available to assist students in the areas of scheduling of major courses, special permission numbers, BS/MS advising, and other areas related to the engineering major course requirements. See the webpage above for more locations and more information.

Absences Verification

Dean of Students office | Hours & Locations: deanofstudents.rutgers.edu

Any student who needs verification of an absence (illness, conference, corporate or graduate school interview, etc.) should contact the Dean of Students office. The Dean of Students will need documentation in order to verify your absence and will then email your professor that your absence has been substantiated. If you know in advance that you will be absent from a class, it is also a good idea to submit the Self-Reporting Absence Application (sims.rutgers.edu/ssra). In both situations this does not necessarily imply that a student will be excused from the class, any assignments that were due or attendance that may be required.

Course or Semester Withdrawal

Online or Visit Engineering B100 | soe.rutgers.edu/add-drop

- The last day to drop a course without a “W” via WEBREG is within the **1st week** of classes.
- The last day to drop a class via WebReg with a 'W' grade is the **8th week**.
- With Dean’s permission from Engineering B100, students may drop SoE courses (14:xxx:xxx) before the **10th week** with a ‘W’ grade.
- Students are not allowed to drop individual class after the **10th week**.
- The last day to withdraw from ALL classes with all ‘W’ grades (semester withdrawal) is the end of the **12th week**.

University Policy on Exam Scheduling and Conflicts

Office of Registrar | nblogistrar.rutgers.edu/facstaff/examrules.htm

The University has a strict policy on not allowing final exams to be scheduled during the last two weeks of the class period. There are also similar policies regarding the reading days and a detailed guideline on how to handle exam conflicts. For more information, please visit the Registrar's page on exam policy above.

Academic Coaching, Tutoring, Learning Support

Rutgers Learning Centers | (848) 445-0986 | lrc.rutgers.edu

Academic coaching is a comprehensive service for students who want to improve their academic and self-management skills, such as time management, organization and study skills. The Rutgers Learning Centers offer this support to help students achieve their academic goals along with self-advocacy and independent, life-long learning. To schedule an appointment, you may visit their website or call.

Student-Wellness Services

Counseling, ADAP & Psychiatric Services (CAPS)

17 Senior Street, New Brunswick | (848) 932-7884 | rhscaps.rutgers.edu

CAPS is a University mental health support service that includes counseling, alcohol and other drug assistance, and psychiatric services staffed by a team of professional within Rutgers Health services to support students’ efforts to succeed at Rutgers University. CAPS offers a variety of services that include: individual therapy, group therapy and workshops, crisis intervention, referral to specialists in the community and consultation and collaboration with campus partners.

Violence Prevention & Victim Assistance (VPVA)

3 Bartlett Street, New Brunswick | (848) 932-1181 | www.vpva.rutgers.edu

The Office for Violence Prevention and Victim Assistance provides confidential crisis intervention, counseling and advocacy for victims of sexual and relationship violence and stalking to students, staff and faculty. To speak with someone immediately, call 848-932-1181.

Disability Services

Lucy Stone Hall, Suite A145, Livingston Campus | (848) 445-6800 | ods.rutgers.edu

Rutgers University welcomes students with disabilities into all of the University's educational programs. In order to receive consideration for reasonable accommodations, a student with a disability must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentation: ods.rutgers.edu/students/documentation-guidelines. If the documentation supports your request for reasonable accommodations, your campus’s disability services office will provide you with a Letter of Accommodations. Please share this letter with your instructors and discuss the accommodations with them as early in your courses as possible. To begin this process, please complete the Registration form on the ODS web site at: ods.rutgers.edu/students/registration-form.

Scarlet Listeners

(732) 247-5555 | scarletlisteners.com

Free and confidential peer counseling and referral hotline, providing a comforting and supportive safe space.

Download the Just-In-Case App: <http://codu.co/cee05e>

Access helpful mental health information and resources for yourself or a friend in a mental health crisis on your smartphone or tablet and easily contact CAPS or RUPD.