

CHEN 4130 Course Syllabus

Chemical Engineering Laboratory 2

Class Meetings: Tue 1:15-6:15 pm in Zoom: <https://cuboulder.zoom.us/j/2251625831>
and BIOT B171 (as feasible)

Instructors: Hendrik Heinz (Tue) Phone: 303-735-7517
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Instructional Videos: <https://www.colorado.edu/chbe/academics/course-descriptions/undergraduate-level-courses/chemical-engineering-lab>

Text (optional): *Writing Style and Standards in Undergraduate Reports, 3rd Edition*
Donnell et al.; College Publishing; 2016; ISBN-13: 978-1932780093

Other Materials: Safety glasses

Course Learning Objectives

- To work in a simulated industrial environment, with emphases on teamwork, open-ended problem solving, project-style report writing, and effective oral communications.
- To provide hands-on operating experience with typical chemical engineering equipment and to obtain experience with heat transfer, fluid flow, separations, thermodynamics and reacting systems.
- To provide experience with planning and implementing experiments.
- To review and practice chemical engineering principles.
- To provide an understanding of, and practice with, the use of statistics and data interpretation with real experimental data.

COVID-19-related modifications: As required per campus policy, our laboratory will only be run virtually via Zoom, i.e., without the very important hands-on components and interactive experimentation. At the same time, we also do not have a lab coordinator as we would under normal operation. Regardless, we intend to run the laboratory as if the experiments are all accessible, and can watch video recordings of the apparatus, carry out the planning and analysis tasks as usual. The major difference will be that the instructors and TAs will provide the measurement data for all experiments that would otherwise be interactively obtained during the lab. The class will therefore focus on learning skills in project planning, teamwork, and technical writing, which are critical to procure new projects and report on outcomes in private companies, government agencies, and academia. Our schedule also includes two computational laboratories (Aspen and COMSOL), which can be carried out remotely without loss. In addition, we will do our best to facilitate short visits to the laboratory – following distancing restrictions – to see the apparatus and experiments from which data are provided, although likely with limited or no operation and data acquisition.

ABET Accreditation Outcomes:

Course-Outcomes Matrix	1	2	3	4	5	6	7
CHEN 4130. Chemical Engineering Laboratory.			X		X		

- (1) an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
- (2) an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
- (3) an ability to communicate effectively with a range of audiences
- (4) an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
- (5) an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
- (6) an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
- (7) an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

General Format of Class

Eleven experiments will be examined in this course:

1. Continuously Stirred Tank Reactor
2. Distillation Column
3. Draining Tank
4. Gas Adsorption
5. Heat Exchanger
6. Hilsch Vortex Tube
7. Pressure Drop
8. Refrigeration
9. Reverse Osmosis
10. Steam Jacketed Tank
11. Tubular Flow Reactor

Each student group will do FIVE of these experiments during the semester according to the Course Schedule. Please see the Course Schedule for all work deadlines.

Assignments and Grading Basis

See Assignments document for list of points per assignment.

Most, if not all, assignments will be turned in through Canvas.

Turn in your assignments on time!!

- Assignments are due at the time/date shown on the Course Schedule.
- Assignments turned in late will be counted for 50% of possible points for 24 hours after the due date/time.
- **No credit** will be given for assignments turned in over 24 hours past the due date.

- There is no penalty for turning in an assignment early!

The letter grade will be assigned based on the final distribution of percentage scores in the class. The final percentage of cumulative points for all grade items translates into letter grades as shown below:

A	93-100 %
A-	90-93 %
B+	87-90 %
B	83-87 %
B-	80-83 %
C	70-80 %
D	60-70 %
F	0-60 %

The final percentage *may* be curved in favor of the average grade of the class.

Attendance

- ALL GROUP MEMBERS MUST ATTEND **ALL** CLASSES.
- **Each** unexcused absence will result in a 10% deduction of the **final** grade.
- Even if you do not need to conduct/evaluate experiments on the 2nd experimental day, you must check in with the instructor at the beginning of class.
- If you must miss a class, work with the instructor ahead of time to see if a make-up is possible.

Lab Make-Ups

- If ALL group members have attended BOTH experimental sessions for a particular experiment and the group still does not have sufficient data, please work with the instructor to schedule lab time outside normal class hours.
- If all group members have NOT attended both experimental sessions, please do not ask to make up a lab outside of the normal class period.

Lab Safety

In conducting the Chemical Engineering Laboratory 2 courses, we require the following practices of students, teaching assistants, and faculty.

Note: NO CELL PHONE USE IS ALLOWED IN LAB.

1. Eye Protection

You must wear eye protection in the lab area. Eye protection must meet ANSI standards. Minimum protection consists of spectacles with side shield.

If you wear glasses, you may obtain safety spectacles with side shields to wear over your glasses. You may also obtain prescription safety glasses with side shields. The lenses in prescription safety glasses are thicker than standard glasses.

If you are observed in the lab without eye protection, you risk being disenrolled from the course.

2. Dress and Appearance (from *Safety in Academic Chemistry Laboratories*, ACS, 1992)

High-heeled or open-toed shoes, sandals, or shoes made of woven material should not be worn in the lab. Shorts, cut-offs, or short skirts are not permitted. Long hair and loose clothing should be constrained. Jewelry such as rings, bracelets, and watches should not be worn, to prevent chemical seepage under the jewelry, contact with electrical sources, catching on equipment, and damage to the jewelry itself.

3. Chemical Safety

Material Safety Data Sheets (MSDS) must be obtained for all experiments using chemicals. Each group member must read and understand the safety precautions and disposal procedures.

Waste chemicals are to be disposed of in appropriate containers located in the Satellite Accumulation Areas (SAA's). They are never to be poured down drains! Chemicals must be stored in approved and labeled containers. Solid materials contaminated by waste chemicals are disposed of in appropriate containers and must not be placed in the standard wastebaskets.

Waste materials, especially "sharps" such as needles and broken glass, must be placed in special containers for these materials. Do not place these items in the standard wastebaskets.

4. Behavior in the Laboratory

Don't

- Run
- Yell, except in an emergency
- Eat, drink, or smoke
- Engage in horseplay or mischief
- Ride anything (bikes, skateboards, inline skates)

Do

- Keep an eye out for hazards
- Think before you act
- Ask, if you have any doubt
- Take your time
- Be careful
- Inform and stay informed

5. Safety Devices

Know where all the fire extinguishers in the vicinity of the lab are and know their type. Know the location of the safety showers and eye washes and how to operate them. Know the escape routes from the lab and where you would call 911 after leaving the lab area.

Submit with First Lab Notebook: Prepare a map of the lab with all fire extinguishers, safety showers and eye wash stations, and show 2 alternate escape routes, using different colors and symbols.

Requirements for COVID-19

As a matter of public health and safety due to the pandemic, all members of the CU Boulder community and all visitors to campus must follow university, department and building requirements, and public health orders in place to reduce the risk of spreading infectious disease. Required safety measures at CU Boulder relevant to the classroom setting include:

- maintain 6-foot distancing when possible,
- wear a face covering in public indoor spaces and outdoors while on campus consistent with state and county health orders,
- clean local work area,
- practice hand hygiene,
- follow public health orders, and
- if sick and you live off campus, do not come onto campus (unless instructed by a CU Healthcare professional), or if you live on-campus, please alert [CU Boulder Medical Services](#).

Students who fail to adhere to these requirements will be asked to leave class, and students who do not leave class when asked or who refuse to comply with these requirements will be referred to [Student Conduct and Conflict Resolution](#). For more information, see the policies on [COVID-19 Health and Safety](#) and [classroom behavior](#) and the [Student Code of Conduct](#). If you require accommodation because a disability prevents you from fulfilling these safety measures, please see the “Accommodation for Disabilities” statement on this syllabus.

All students who are new to campus must complete the [COVID-19 Student Health and Expectations Course](#). Before coming to campus each day, all students are required to complete the [Buff Pass](#).

Students who have tested positive for COVID-19, have symptoms of COVID-19, or have had close contact with someone who has tested positive for or had symptoms of COVID-19 must stay home. In this class, if you are sick or quarantined, please let the instructor know as soon as possible.

Ethical Standards – Honor Code

This course follows the University Honor Code.

Absolutely no RESUBMISSION is allowed. This means a student cannot resubmit one of his or her own papers – or part of it – whether it was from a different college course or high school.

All students enrolled in a University of Colorado Boulder course are responsible for knowing and adhering to the Honor Code. Violations of the policy may include: plagiarism, cheating, fabrication, lying, bribery, threat, unauthorized access to academic materials, clicker fraud, submitting the same or similar work in more than one course without permission from all course instructors involved, and aiding academic dishonesty. All incidents of academic misconduct will be reported to the Honor Code (honor@colorado.edu); 303-492-5550). Students found responsible for violating the academic integrity policy will be subject to nonacademic sanctions from the Honor Code as well as academic sanctions from the faculty member. Additional information regarding the Honor Code academic integrity policy can be found at the [Honor Code Office website](#).

The following actions will not be tolerated and will be grounds for academic penalty as deemed appropriate by the instructor and in compliance with University Honor Code.

1. Papers submitted by any student, written in part or in whole by someone other than that student; in addition, submitted papers that have already been submitted for a different class (“resubmission”).
2. Vandalism, destruction of property, stealing.
3. Violation of CU guidelines and standards.

These actions shall be considered to constitute fraud under the University Honor Code or unacceptable or criminal behavior. The penalties can include, but are not limited to, a reduction in assigned grade, receiving an F on the assignment or for the course, or personal responsibility to correct the violation.

Accommodation for Disabilities

If you qualify for accommodations because of a disability, please submit your accommodation letter from Disability Services to your faculty member in a timely manner so that your needs can be addressed. Disability Services determines accommodations based on documented disabilities in the academic environment. Information on requesting accommodations is located on the [Disability Services website](#). Contact Disability Services at 303-492-8671 or dsinfo@colorado.edu for further assistance. If you have a temporary medical condition or injury, see [Temporary Medical Conditions](#) under the Students tab on the Disability Services website and discuss your needs with your professor.

Religious Holidays

Campus policy regarding religious observances requires that faculty make every effort to deal reasonably and fairly with all students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance. In this class, please let me know of any upcoming observances and holidays at least two weeks in advance.

See the [campus policy regarding religious observances](#) for full details.

Classroom Behavior

Both students and faculty are responsible for maintaining an appropriate learning environment in all instructional settings, whether in person, remote or online. Those who fail to adhere to such behavioral standards may be subject to discipline. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with race, color, national origin, sex, pregnancy, age, disability, creed, religion, sexual orientation, gender identity, gender expression, veteran status, political affiliation or political philosophy. For more information, see the policies on [classroom behavior](#) and the [Student Code of Conduct](#).

Sexual Misconduct, Discrimination, Harassment and/or Related Retaliation

The University of Colorado Boulder (CU Boulder) is committed to fostering a positive and welcoming learning, working, and living environment. CU Boulder will not tolerate acts of sexual misconduct (including sexual assault, exploitation, harassment, dating or domestic violence, and stalking), discrimination, and harassment by members of our community. Individuals who believe they have been subject to misconduct or retaliatory actions for reporting a concern should contact the Office of Institutional Equity and Compliance (OIEC) at 303-492-2127 or cureport@colorado.edu. Information about the OIEC, university policies, [anonymous reporting](#), and the campus resources can be found on the [OIEC website](#).

Please know that faculty and instructors have a responsibility to inform OIEC when made aware of incidents of sexual misconduct, discrimination, harassment and/or related retaliation, to ensure that individuals impacted receive information about options for reporting and support resources.

Preferred Student Names and Pronouns:

CU Boulder recognizes that students' legal information does not always align with how they identify. Students may update their preferred names and pronouns via the student portal; those preferred names and pronouns are listed on instructors' class rosters. In the absence of such updates, the name that appears on the class roster is the student's legal name.

Wellness Resources:

We are here to help you grow as a student and as a person. Feel free to get in touch about academic topics as well as beyond the classroom. From our CEAS Values Statement:

“We here at the College of Engineering and Applied Science (CEAS) value one another as human beings first and embrace practices to support the health, wellness, and success of all CEAS community members. We prioritize the well-being of all members of our community -- students, faculty, and staff. Community wellness begins with respect, empathy and inclusion, and we strive to develop well-balanced healthy individuals. We support conversations around mental health and health-seeking practices.”

- Need to talk something through? Free, informal, and confidential consultation with a counselor
“E-Let’s Talk”
colorado.edu/counseling/lets-talk
- Counseling & Psychiatric Services
(303) 492-2277 (24/7 support)
colorado.edu/counseling