Teaching Portfolio

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Curriculum Vitae (CV)

Kristine Loh
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EDUCATION

University of Minnesota – Twin Cities — Minneapolis, MN
Doctor of Philosophy, Chemical Engineering — Anticipated Graduation: June 2025
National Science Foundation Graduate Research Fellow
College of Science and Engineering Fellow

Drexel University, Pennoni Honors Program, Summa Cum Laude — Philadelphia, PA
Accelerated Master of Science in Materials Science and Engineering — June 2020
Thesis Title: Optimization of Photodetection Analysis of MXene Thin Films
Bachelor of Science in Chemical Engineering — Cumulative GPA: 3.96
Certificate in Technical Communication and Publishing

Ruhr-Universität Bochum — Bochum, Germany
Exchange Undergraduate Student in Mechanical Engineering — April to June 2018

RESEARCH EXPERIENCE

Ferry and Kortshagen Groups — Minneapolis, MN
Graduate Research Fellow — *January 2021 to Present*
Advisors: Drs. Vivian Ferry and Uwe Kortshagen
- Utilize nonthermal plasma to synthesize silicon nanocrystals (Si NCs) for solar concentrator applications
- Characterize Si NCs using steady-state and time-resolved PL spectroscopy, FTIR, XRD, and EPR
- Deposited homogenous silicon nitride thin films using rotating stage motor
- Simulated optical performance of luminescent solar concentrators with Monte Carlo ray-tracing MATLAB code

Nanomaterials for Energy Applications and Technology (NEAT) Lab — Philadelphia, PA
Undergraduate Research Assistant — *April 2017 to June 2020*
Students Tackling Advanced Research (STAR) Scholar — *June to August 2016*
Advisor: Dr. Jason B. Baxter
- Investigated mechanisms of $Ti_3C_2T_x$ and $Mo_2TiC_2T_x$ film optoelectronic behavior in response to various stimuli through photoconductivity measurements
- Led research efforts on using Ti-doped hematite thin films synthesized using Successive Ionic Layer Adsorption and Reaction (SILAR) as an enhanced photoelectrochemical water splitter
- Analyzed SbSI microrods as novel pathways for electron transport using UV-Vis, SEM, EDS, and XRD
- Synthesized $CuSbS_2$ thin films using chemical bath deposition

Emmy Noether Research Group — Bochum, Germany
Independent Research Project — *April 2018 to June 2018*
Advisor: Dr.-Ing. Markus Richter
- Collaborated in two-member team to study ability of potassium phosphate to absorb carbon dioxide gas and hydrogen gas under various temperatures and pressures
- Used two-sinker magnetic suspension densimeter to collect experimental data and MATLAB to compile results

Johnson & Johnson Consumer, Inc. — Fort Washington, PA
R&D Analytical Chemistry Co-op — *September 2017 to March 2018*
Advisor: Dr. Michael Breslav
- Developed and executed active pharmaceutical ingredient (API) extraction tests for HPLC analysis
- Designed and conducted heat and humidity stress experiment to determine long-term stress effects on API degradation products
- Supported 5 analytical scientists through diluent, mobile phase, and sample preparation

MANUFACTURING EXPERIENCE

Crazy Aaron's Enterprises Norristown, PA
Materials & Process Engineer Co-op *April 2019 to September 2019*
- Tripled production of new product line and served as subject matter expert on business merger
- Authored company-wide lean documentation to reduce defects and to highlight safety precautions
- Developed 4 new inventory items to increase process efficiency, saving over $30,000 annually
- Researched and developed customizable room-temperature vulcanizing silicone for mass production
- Trained and supervised 6 operators on new techniques, products, and process improvements

Noramco, Inc. Wilmington, DE
Process Engineering Co-op *September 2016 to August 2017*
- Created 5 startup and preconditioning procedures to improve process efficiency and prevent salt formation
- Contributed to 2 new API product introductions by interfacing with operators and developing technical documentation
- Updated and refined batch records for process improvement savings of up to $200,000 per campaign
- Analyzed lab testing data, equipment trends and charts, batch yield efficiency, and SAP reports for both narcotic yield investigations and process validation reports

MENTORSHIP EXPERIENCE

Research Mentorship
Adriana Chapez, MRSEC REU Student June 2022 to August 2022
Currently undergraduate Mechanical Engineering student at the University of Texas Rio Grande Valley
Dr. Zuhair Khan, Visiting Research Professor March 2022 to May 2022
Noura Rayes, ME3 REU Student June 2021 to August 2021
Currently PhD Student in Materials Science and Engineering at the Penn State University

Current Professional Mentorship Program Participation
Formal mentees in Drexel SWE Professional Mentorship, UMN Women in Science and Engineering Initiative Undergrad-Grad Mentorship, Friend in STEM Research Mentorship, virtual Professional Advancement through Career Education (PACE), and GradSWE Mentorship Programs

TEACHING EXPERIENCE

University of Minnesota
Preparing Future Faculty Program September 2022 to Present
- Prepared syllabus, teaching philosophy, and diversity statement documents while learning about inclusive pedagogy, universal course design, and classroom assessment techniques through GRAD 8101 class

CHEN 3102: Reaction Kinetics January 2021 to May 2021
- Proctored exams for students with accommodations from the Disability Resource Center (DRC)
- Graded weekly homework assignments for 99 undergraduate students
- Held weekly office hours and supported two recitation sections a week

PUBLICATIONS

K.Q. Loh, U.R. Kortshagen, V.E. Ferry, *Tunable, high intensity photoluminescence from Si/SiO_2 core/shell nanocrystals* via *high-pressure water vapor annealing*. Submitted.

POSTER PRESENTATIONS

Loh, K., Kortshagen, U.R., Ferry, V.E. (June 2022). *Tunable, high intensity photoluminescence from Si/SiO_2 core/shell nanocrystals for LSCs*. Poster Presentation. Industrial Partnership for Research in Interfacial & Materials Engineering, Minneapolis, MN.

Loh, K., Hantanasirisakul, K., Maleski, K., Gogotsi, Y., Baxter, J.B. (October 2019). *Understanding Time-Dependent Light-Matter Interactions of Mo_2TiC_2 MXene Films.* Poster Presentation. Future Leaders in Chemical Engineering Award Symposium, North Carolina State University, Raleigh, NC. (September 2019). Distinguished Undergraduate Research Workshop, Wayne State University, Detroit, MI.

Loh, K., Edley, M.E., Baxter, J.B. (February 2018). *SbSI Microrods as a Ferroelectric Solar Cell Absorber Material.* Poster Presentation. SASE Northeast Regional Conference, Stevens Institute of Technology, Jersey City, NJ. **Received 1st Place Prize in Life Sciences Category.** (May 2017). Week of Undergraduate Excellence, Drexel University, Philadelphia, PA. (April 2017) Stanford Research Conference, Stanford University, Stanford, CA. (February 2017). SWE Region E Conference, Syracuse University, Syracuse, NY. **Received 4th Place Prize Overall.** (August 2016). STAR Scholars Summer Showcase, Drexel University, Philadelphia, PA.

SKILLS

Laboratory: Nonthermal plasma nanocrystal synthesis, FTIR, XRD, PLQY, TRPL, EPR, HPLC, SILAR, PEC Testing, UV-Vis, Glove Box
Software: Origin 8, AutoCAD, Fusion 360, MATLAB, Blender, SAP, Trackwise, Empower, Microsoft Office
Foreign language: Conversational Mandarin Chinese, Limited Working Proficiency Spanish, Basic German

SELECTED HONORS AND AWARDS

While at University of Minnesota

Outstanding Teaching Assistant Award	October 2021
Society of Women Engineers Outstanding Collegiate Member	September 2021
National Science Foundation Graduate Research Fellowship ($138,000)	March 2021
College of Science and Engineering Fellowship at UMN ($50,000)	February 2020

While at Drexel University

2020 Drexel University Undergraduate Commencement Speaker	June 2020
Dean's List (All Terms), Drexel University	September 2015 to June 2020
2020 Drexel University CoE Outstanding Undergraduate Student Award	January 2020
2019 CBE Undergraduate Student Achievement Award	November 2019
2019 CBE Undergraduate Student Service Award	November 2019
Society of Women Engineers Guiding Star Award (1 of 7 nationally)	February 2019
Supernova Undergraduate Research Fellow, Drexel University	September 2017
Society of Women Engineers Future Leader (SWEFL) (1 of 31 internationally)	June 2017
Kappa Theta Epsilon, Co-op Honor Society, Drexel University	June 2017
Frances Velay Fellow (1 of 8 students), Drexel University ($3,500)	June 2016
National Achievement Full Tuition Scholarship	September 2015 to June 2020

PROFESSIONAL AND VOLUNTEER SERVICE

CEMS Women+ Group at UMN

Undergraduate Coordinator	July 2022 to Present
General Coordinator	September 2020 to June 2021

Science for All at UMN

Webmaster	July 2022 to Present
General Volunteer	July 2021 to July 2022

Graduate Student Committee (GSC)

FY-2020 Cohort Representative	September 2022 to Present

CEMS Students Organizing Against Racism (SOAR)

Outreach Team Volunteer and Video Contributor	February 2022 to Present

Council of Graduate Students (COGS)
Grant Reviewer (Fall, Spring, and Summer Cycles) — September 2020 to Present

Pink Space Theory
STEM Panel Organizer and Fundraiser, Webinar Moderator, and Grant Writer — June 2020 to July 2022

CovEducation
AP Calculus, AP English, and Middle School Reading Tutor — March 2020 to June 2022

American Institute of Chemical Engineers
Education Division Communications Committee Member — December 2022 to Present
Minority Affairs Committee Communications Team Member — April 2020 to July 2021

College of Engineering, Drexel University
Chair of Joint One-Time Undergraduate Faculty Evaluation Committee — September 2019 to January 2020
Recruitment and Outreach Assistant — June 2018 to June 2020

PROFESSIONAL AFFILIATIONS AND LEADERSHIP POSITIONS

Society of Women Engineers (SWE)
University of Minnesota
GradSWE Committee Chair — March 2021 to July 2022

Societal
Culture & Heritage Lead for Asian Connections Affinity Group — July 2022 to Present
Community Lead for Asian Connections Affinity Group — February 2020 to July 2022
SWENext High School "Day in the Life" Reporter — February 2020 to July 2022

Drexel University
Membership Director — January 2019 to December 2019
President — January 2018 to December 2018
Outreach Director — December 2015 to December 2017

Society of Asian Scientists and Engineers (SASE)
Drexel Chapter Events Coordinator — June 2018 to June 2019
PR Committee Researcher — July 2016 to June 2018

PROFESSIONAL DEVELOPMENT AND CERTIFICATE PROGRAMS

The Inclusive STEM Teaching Project Completion — November 2022
Teaching Assistant Professional Development (TAPD) Program Completion — August 2022
Institute on Teaching and Mentoring Participant — April 2021
GradSWE Mentorship Program Mentee — October 2020 to Present

Teaching Philosophy

While I had a penchant for math and science growing up, I did not know what to do with these interests as I had no familial or community connections in STEM careers. My interest in engineering started when I worked at my father's Chinese take-out restaurant in high school, where I regularly packed hot food. The food packaging was ineffective and cumbersome but was the only option we had to save costs. I was determined to be the person who would increase accessibility to safe, cheap, and environmentally friendly products (that didn't lead to minor burns from Wonton soup) and I found that chemical engineering was the path to do so. Drawing on my own motivation to pursue engineering, I will design my courses such that students find their own spark to engineer change and build connections to the world around them.

Although finding the inspiration to pursue STEM careers is critical to student engagement, retaining these students despite the leaky STEM pipeline for underrepresented groups holds the same weight. Inclusive course design, utilization of active learning strategies, and socially-relevant assignments can aid in this effort because these empirically-backed methods have been proven to minimize disparities in STEM education. I aim to ground students' motivation to engage in the classroom in settings that they can visualize and connect with, leaning on Professor Anna Marie LaChance's pedagogical framework of "abolitionist engineering education." By incorporating broader social issues, including environmental injustice, water insecurity, and culturally-relevant engineering problems, into the course content, I will present students with the opportunity to integrate activism with their education as they grow into STEM professionals. For example, I will utilize structured classroom debates, analysis of case studies, and engineering calculations based in real-world scenarios; each of these assignments will allow students to choose an engineering problem that aligns with their personal interests. In this way, students can not only see how the concepts that they learn and the tasks they accomplish directly connect with the changing world around them, but they will also find the motivation to tackle the problems they are passionate about.

In Spring of 2021, I was a Teaching Assistant (TA) for an online, undergraduate-level Reaction Kinetics and Reaction Engineering course with 99 students. When grading homework assignments, I formulated a rubric for each homework problem and assigned partial credit to all student attempts. I valued the use of the correct equations and the setup of the problem over the correct final answer. To inform students of improvements for future assignments, I left comments on Canvas for each of their submissions with explicit reasonings for point deductions and/or positive feedback. I also volunteered to proctor online exam sessions for students with accommodations from the Disability Resource Center. To streamline the already stressful exam process, I reminded students both verbally and in the Zoom chat of exam guidelines. I gave regular timepoint check-ins in these two formats so students could pace themselves accordingly. Through my efforts to reduce stress and increase transparency in this class, I was awarded an Outstanding TA Award from my department.

In alignment with my initial teaching experience as a TA, I believe that rigor and mental well-being are not mutually exclusive in engineering classrooms. After completing the TA and Postdoc Professional Development Program offered through the Center for Education Innovation, I was inspired by the consistent message that inclusive classroom practices benefit everyone. Clear communication, transparency in grading, and accessible options to assess student learning will not only allow for an improved learning experience but will also improve the retention of minoritized students whose learning strategies may not align with traditional assessment methods. This program taught me how to honor

students' diverse backgrounds and build a more inclusive environment for all. By implementing frequent, low-stakes assessments, such as weekly pre-lecture quizzes and in-class ungraded assignments, my courses will increase student engagement and enhance knowledge retention. All of my assessments will be open-book and open-notes, as this setting mirrors the current environment for engineering professionals; engineers in industry have multiple tools (e.g. online resources, mentors, and textbooks) to solve engineering problems. Providing students with options for their final assessment will also allow them to exercise their STEAM (science, technology, engineering, art, and math) capabilities. While some students may prefer the traditional, timed, written final exam, I will also provide creative options, including verbal exams, visual representations of engineering concepts, and even song renditions of learning outcomes. These assessments will all be held to the same grading standards but will provide students with more flexibility to apply the knowledge they have gained in the course.

Outside of the classroom, I have had the privilege of being a research mentor to two Research Experience for Undergraduates (REU) students, who were members of underrepresented groups themselves. Guided by my mentors' teaching styles, I trained my mentees in a three-step program. First, I had them shadow me while I conducted my experiments, allowing them to ask me any questions along the way. Then, I let them conduct the experiment while I shadowed, guiding them through any hesitations they might have. Finally, they conducted the experiment on their own, while I was available nearby for any questions. I implemented this process with regular checkpoints for feedback and communication; I aim to utilize this same philosophy in my classroom assessments. Regular feedback from my future students will not only benefit them in their learning process, but will also aid in my growth as an instructor and mentor. In the classroom, I will work through a problem set in front of students, give them the opportunity to work through similar problems themselves, and then challenge them to solve a problem on their own. I believe students will be more likely to succeed if they are presented with examples of success to follow. This philosophy not only applies to coursework, but also to my own identity. As a queer woman of color, I aim to embody the motto of "see her, be her" in the classroom, and show my students that this career is a feasible option for them too.

In my personal and professional development journey, I learned that no single learning method applies to all learners. However, inclusive, intentional course design can improve learning experiences and can encourage underrepresented learners to persist in their education. Driven by my goal to improve the retention of underrepresented students in STEM, I will use culturally-relevant examples in the classroom, flexible active learning strategies, and inclusive course policies to design meaningful courses that show students their work has tangible impacts in global contexts.

CHEN 201: Material and Energy Balances (Fall 2025) Syllabus

Class Information

Days and Times

Tuesdays and Thursdays,
10 – 11:50 am
September 6 – December 22

Class Location

Amundson Hall, Room 130
OR on Zoom (>24 h notice)

Prerequisites

CHEM 121 and MATH 122
OR ability to apply principles of stoichiometry and familiarity with solving linear systems of equations

Instructor Information

Instructor

Dr. Kristine Loh
(she/her)

Email

kloh@umn.edu
Zoom: umn.zoom.us/kloh201

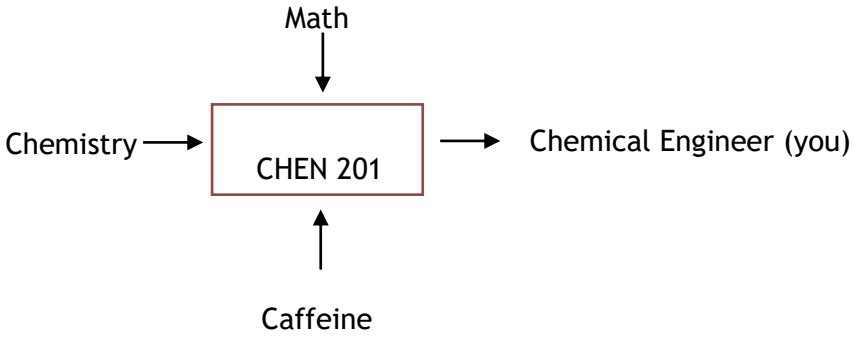
Office Location & Hours

Amundson Hall, Room 488
Mondays and Wednesdays,
10 – 11 am or by appointment

General Information

Why We're Here

To introduce you to the first step in your journey as chemical engineers. You'll get a taste for the driving principles of the field and get a comprehensive sense of how chemical engineers can make a difference in various industries. You'll also learn how to read and make a diagram like this:



Course Description

This course will prepare you to break down complex systems into manageable units (smaller control volumes) within the context of chemical processing problems. You will learn how to make sure every moving part in your system is accounted for by formulating and solving material and energy balance equations. Most importantly, you will learn how to *think like an engineer*: with the information you have been given, you will identify unknown variables (find what you are trying to solve for), establish relations between known and unknown parameters (set up your equations), and obtain your solution using appropriate computational methods (get your final answer!).

Course Goals

After completing this course, you should be able to:

- Identify your process constraints and make appropriate assumptions
- Convert a verbal description of a process into a well-labeled process flowchart
- Formulate material and energy balance equations for single-unit and multiple-unit processes, processes with recycle and bypass, and reactive processes
- Use spreadsheets (Excel) to solve material and energy balance problems
- Understand the breadth of a chemical engineering career and become aware of notable chemical engineers from diverse backgrounds

Expectations

As chemical engineers, we adopt a shared Code of Ethics (see this example from the American Institute of Chemical Engineers). As professionals, we should strive to uphold and advance the integrity, honor, and dignity of the engineering profession. While this classroom is a bit different from a company, we should hold ourselves to the same standard codes of conduct. At a company, this would look like carefully checking your calculations, informing clients if something is unsafe, and accepting responsibility for your actions. In the classroom, this looks like attempting each homework problem, paying attention and asking questions during class time, learning from your mistakes, and so on:

For the Students

- Be present and on-time to class
- Be respectful of others
- Participate in class activities
- Submit original and high-quality work
- Put forth your best effort given your capacities
- Be accountable for your portion of work in team settings
- Advocate for yourself and your needs by communicating with the instructor in a respectful manner

For the Instructor

- Be well-prepared for class instruction
- Use data-driven teaching techniques
- Give thoughtful and timely feedback
- Use inclusive language and celebrate diversity in the classroom
- Provide course-related and career-related resources
- Provide a safe and positive learning atmosphere
- Be mindful of students' needs while respecting her own boundaries

What does a respectful manner mean?

If you are making an earnest effort in the course, I will do everything in my power to help you. However, I am not going to be accessible 24/7 through email. Emails sent after 5 PM CST will not be returned until at least the following business day. I will try my best to get a response back to you within 24 hours. When sending emails, please include a greeting and signature in the email text. In the subject line, include "CHEN 201" and a brief descriptor of your message. Always address your instructors as "Professor *Last Name*" or "Dr. *Last Name*" unless told otherwise. I will hold you to these expectations in this course because this will prepare you for professional communication in your future workplaces. While this might be more formal than most exchanges, it is better to start overly polite than too casual or curt.

Course Materials

Required Text

R.M Felder, R.W. Rousseau, and L.G. Bullard, *Elementary Principles of Chemical Processes*, 4th Edition. I am NOT recommending that you use libgen (dot) is to get a free PDF of your textbook. I will discuss other websites that I am OFFICIALLY NOT RECOMMENDING in class.

Course Grading and Assignments

CHEN 201 uses the A-F (non-contract) grading system. Grades will be assigned as follows:

A > 93; A- = 90-93; B+ = 87-89; B = 84-86; B- = 80-83; C+ = 77-79; C = 74-76; C- = 70-73; D+ = 67-69;

D = 64-66; F < 63.

Participation in the class will be considered to round up grades when calculating final scores. Grades will *never* be rounded down.

Your grade will be determined as follows:

- **Homework assignments (40%, lowest two grades dropped):**
  There will be approximately nine homework assignments in this course, spaced out roughly once a week. Homework assignments will be posted on the Canvas page at least one week prior to the due date. Your solutions need to be submitted to the **CHEN 201 mailbox on the due date before 4 PM CST**. Please print out Excel sheets if needed. The CHEN office closes at 5 PM, so be sure to submit your homework on time for collection. **Late homework assignments will only be accepted without penalty if you communicate your needs in advance**. Please email me if you need more time at least 12 hours before the 4 PM on the due date following the email guidelines in the expectations section.

  Strategy for Learning: You will be provided with the solutions to the assigned problems 24 hours prior to the deadline. Despite being provided the solutions, you must submit **your own solution set** which should be different than the solution set I provide for you. Engineers do not work alone – we all need some help sometimes. However, you are still expected to do your own work and **not plagiarize** the solutions. The provided solution sets should serve as hints for you to guide you if you get stuck, **not** as an answer for you to copy down.

  Strategy for Success: Skim through the homework assignment once it is posted on Canvas. Consider going to office hours if you are not sure about what a particular problem is asking for. Attempt each homework problem before looking through the solutions for a hint. To distinguish your solution from the provided solution set, add more information! Be clear about the assumptions you make, what your variables are, and why you are using certain values to solve the problem. This will demonstrate to me that you put in a sincere effort into this assignment.

- **Final project and peer review (30%):**
  You will be creating a presentation on a notable chemical engineer and designing a simple mass and/or energy balance problem around their area of expertise. You will also need to work through the problem with the class and explain why you designed the process that you chose. I strongly recommend you to review AIChE's features of diverse engineers as a starting point (i.e. this series on featured LGBTQ+ engineers). No more than two students per class will be highlighting the same engineer. I will send out a Google sheet for you to submit the engineer you would like to feature and to see if others have already chosen that engineer.

Prior to the final presentation date, you will be submitting an outline of your presentation and a process flowchart. You will also be peer reviewing another classmate's work following a rubric that will be posted on Canvas.

- **Midterm exams (20%, lowest grade dropped):**
  There will be three midterm exams during lecture periods and I will drop the lowest grade when calculating your final score. The exams will be open-book and open-notes, but I **strongly recommend making a reference sheet** with important equations, concepts, and diagrams. This will not only help you study, but will also save you time wasted on flipping through your textbook to find the right equation. You are also expected to bring your own calculator to each exam. Since the lowest grade is dropped, there will be **no makeup exam**. Please contact me if you need to miss two exams or more.

- **Participation (10%):**
  There will be weekly ten-minute, closed book/notes, quizzes in lecture on Thursdays that will be ungraded, but still collected. These quizzes will assess your knowledge of the week's content but will also provide space for you to give feedback on the course and my instruction. Attending class and submitting these quizzes will count toward your participation grade. You will be given two "freebie" weeks to miss with no penalty and no questions asked. Please just let me know by e-mail that you will be using your attendance pass for that week.

Policies and Practices

The following statements combine the articulation of my own values, the University of Minnesota's values, and other chemical engineering educators' values. The University's full policy list is at the end of this syllabus.

Ethics and Inclusivity Statements: We acknowledge that the University of Minnesota Twin Cities is built within the traditional homelands of the Dakota people. It is important to acknowledge the peoples on whose land we live, learn, and work as we seek to improve and strengthen our relations with our tribal nations. We also acknowledge that words are not enough. We must ensure that our institution provides support, resources, and programs that increase access to all aspects of higher education for our American Indian students, staff, faculty, and community members. At the University of Minnesota, you can find more resources at the Multicultural Center for Academic Excellence (MCAE) which houses the Circle of Indigenous Nations.

We embrace a notion of intellectual community enriched and enhanced by diversity along a number of dimensions, including race, ethnicity and national origins, gender and gender identity, sexuality, class and religion. We are especially committed to increasing the representation of those populations that have been historically excluded from participation in U.S. higher education.

This course also affirms people of all gender expressions and gender identities. If you prefer to be called a different name than what is indicated on the class roster, please let me know. Additionally, feel free to correct me on your preferred gender pronoun. If you have any questions or concerns, please do not hesitate to contact me.

Mental Health: It's OK to not be OK. Please get the resources and support you need to stay mentally healthy. University services are available to assist you. Learn more about the broad range of confidential mental health services, including both counseling and asynchronous wellbeing programs, offered both on campus and virtually through the Student Mental Health Website.

Disability Accommodations: I respect that each student has their own learning needs and we will work together to dismantle the notion of what a "respectable student" looks like. If you need time during class to eat, decompress, listen to white noise, or other things to help you stay engaged in class, all I ask is that **you are mindful of your classmates needs as well**. This would look like wearing appropriate headphones, refraining from making rude comments in class, or sitting close to the exit if you know you will need to leave during the class time.

The University views disability as an important aspect of diversity, and is committed to providing equitable access to learning opportunities for all students. The Disability Resource Center (DRC) is the campus office that collaborates with students who have disabilities to provide and/or arrange reasonable accommodations.

- If you have, or think you have, a disability in any area such as, mental health, attention, learning, chronic health, sensory, or physical, please contact the DRC office on your campus (UM Twin Cities - 626.1333) to arrange a confidential discussion regarding equitable access and reasonable accommodations.
- Students with short-term disabilities, such as a broken arm, can often work with instructors to minimize classroom barriers. In situations where additional assistance is needed, students should contact the DRC as noted above.
- If you are registered with the DRC and have a disability accommodation letter dated for this semester or this year, please contact me within **the first three weeks of the course** to review how the accommodations will be applied in the course.
- If you are registered with the DRC and have questions or concerns about your accommodations please contact your drc@umn.edu

Scholastic Dishonesty: I understand the pressures you all face during the academic semester can be intense, and that the temptation to engage in academic dishonesty can at times be high. However, the department is committed to the highest standards of academic honesty and integrity. You are expected to do your own academic work and give credit where it is due (i.e. cite sources in your final presentation). Failing to do so is scholastic dishonesty. Scholastic dishonesty means plagiarizing; cheating on assignments or examinations; engaging in unauthorized collaboration on academic work; taking, acquiring, or using test materials without faculty permission; submitting false or incomplete records of academic achievement; acting alone or in cooperation with another to falsify records or to obtain dishonestly grades, honors, awards, or professional endorsement; altering, forging, or misusing a University academic record; or fabricating or falsifying data, research procedures, or data analysis. The Office for Community Standards (OCS) has compiled a useful list of Frequently Asked Questions pertaining to scholastic dishonesty. If you have any questions about whether something is scholastic dishonesty or not, please contact me and ask.

If a student is found to have engaged in academic dishonesty, the following will occur:

1. I will present the student with evidence of the scholastic dishonesty in a one-on-one meeting.
2. The student will have the opportunity to respond, in accordance with the policy from the Office for Community Standards.
3. If I have found that the dishonesty has not occurred, no report will be made to OCS and no sanctions will occur.
4. Otherwise, the case will be referred to OCS and the following sanctions will occur:
    a. If the academic dishonesty is confined to a single examination and the student has admitted fault, the student may be given the option to take an oral examination or closely proctored written examination to demonstrate their understanding of the material on the exam where they engaged in academic dishonesty. The grade on that supplemental exam will, at most, replace the original exam grade. If the student fails

the supplemental exam, they will receive an F in the course. The decision to offer a supplemental exam is at the instructor's discretion. In the absence of a supplemental exam, the student will receive a grade of zero on the exam in question. In either case, the student will receive a grade no higher than a C- in the course.

b. If the academic dishonesty is confined to a single examination and the student challenges the finding of academic dishonesty, the case will be referred to OCS with a sanction of an F in the course.**
c. If academic dishonesty extends beyond a single exam to an additional exam or homework, the program policy for sanctions is that the student receive an F in the course.**
d. If the academic dishonesty is not related to an exam, the sanction will be determined by the instructor.**

** In all cases, students may challenge the findings of academic dishonesty, in which case the disagreement will be resolved by OCS

Regrading of Exams and Homework: You will be allowed to submit request for regrading within **48 hours** of the grade being returned to you. You will not be able to request a regrade after this deadline. The request should be made verbally either after class or in office hours or in writing through email. For an email request, please indicate the possible error. I am happy to make reasonable adjustments but discourage nitpicking or grade grubbing. Submitting an altered exam or problem for regrading is **scholastic dishonesty** and can result in an "F" for the course.

Sanctuary Class: CHEN 201 is a sanctuary class. Recent hateful rhetoric and policies have moved me to protect you all to the best of my ability, and this start with making this class a safe space for learning for all students. Fortunately, the University of Minnesota supports being a sanctuary campus. A sanctuary class means that I won't help law enforcement officials in the marginalization, exclusion, or deportation of undocumented students, colleagues, or staff. I will vigorously defend against bullying and harassment of those targeted for any aspect of who they are.

If ICE finds its way to our door, I'll 1) ask what they are there for; 2) ask for identification, and; 3) ask to see and inspect a warrant signed by a judge. If the agent fails to produce the warrant, or if it's defective, I will state, "I don't consent to your entry." These agents are not entitled to the immigration status of my students and I will put my best effort into keeping you all safe.

Statement References:

Prof. Anna Marie LaChance from the University of Massachusetts at Amherst's STEAM Zine Syllabus (Ethics and Inclusivity statements)

Prof. Matthew Neurock from the University of Minnesota's CHEN 3102 Syllabus (Scholastic Dishonesty statements)

Prof. Ron Bishop from Drexel University's COM 160 Syllabus (Sanctuary Class statements)

Course Schedule

Week	Date	Topic	What's Due?
1	Sep 6	Intro, Syllabus, Course Policies & Procedures	
	Sep 8	Engineering Calculations	HW1
2	Sep 13	Processes & Process Variables	
	Sep 15	Fundamentals of Material Balances	HW2
3	Sep 20	Degrees of Freedom and how to use Excel	
	Sep 22	Material Balances: Single-Unit Processes	HW3
4	Sep 27	Material Balances: Multiple-Unit Processes	
	Sep 29	Material Balances: Multiple-Unit Processes + Review	HW4
5	Oct 4	**Midterm Exam 1**	
	Oct 6	Material Balances: Reactive Systems	
6	Oct 11	Material Balances: Reactive Systems	
	Oct 13	Material Balances: Reactive & Combustion Systems	HW5
7	Oct 18	Material Balances: Reactive & Combustion Systems	
	Oct 20	Single-Phase Systems: Ideal Gases	HW6
8	Oct 25	Multiphase Systems: Single Component Gas-Liquid	
	Oct 27	Multiphase Systems: Single Component Gas-Liquid	HW7
9	Nov 1	Final Project Discussion + Review	
	Nov 3	**Midterm Exam 2**	
10	Nov 8	Multiphase Systems: Multicomponent Gas-Liquid	
	Nov 10	Multiphase Systems: Multicomponent Gas-Liquid	HW8
11	Nov 15	Fundamentals of Energy Balances	
	Nov 17	Energy Balances: Thermodynamic Data Tables	HW9
12	Nov 22	Energy Balances: Steam Tables	
	Nov 24	NO CLASS – HAPPY THANKSGIVING!	

13	Nov 29	Energy Balances on Nonreactive Processes + Review	Project Outline
	Dec 1	**Midterm Exam 3**	
14	Dec 6	Energy Balances: Single-Phase, Nonreactive Systems	Peer Review
	Dec 8	Energy Balances: Phase Change Operations	
15	Dec 13	Final Presentations	
	Dec 15	Final Presentations	

UMN Policies

Student Conduct Code: The University seeks an environment that promotes academic achievement and integrity, that is protective of free inquiry, and that serves the educational mission of the University. Similarly, the University seeks a community that is free from violence, threats, and intimidation; that is respectful of the rights, opportunities, and welfare of students, faculty, staff, and guests of the University; and that does not threaten the physical or mental health or safety of members of the University community.

As a student at the University you are expected to adhere to Board of Regents Policy: Student Conduct Code. Please review the Student Conduct Code.

Note that the conduct code specifically addresses disruptive classroom conduct, which means "engaging in behavior that substantially or repeatedly interrupts either the instructor's ability to teach and/or a student's ability to learn." The classroom extends to any setting where a student is engaged in work toward academic credit or satisfaction of program-based requirements or related activities.

Use of Personal Electronic Devices in the Classroom: Using personal electronic devices in the classroom setting can hinder instruction and learning, not only for the student using the device but also for other students in the class. To this end, the University establishes the right of each instructor to determine if and how personal electronic devices are allowed to be used in the classroom. For complete information, please reference the guidelines for student responsibilities.

Scholastic Dishonesty: You are expected to do your own academic work and cite sources as necessary. Failing to do so is scholastic dishonesty. Scholastic dishonesty means plagiarizing; cheating on assignments or examinations; engaging in unauthorized collaboration on academic work; taking, acquiring, or using test materials without faculty permission; submitting false or incomplete records of academic achievement; acting alone or in cooperation with another to falsify records or to obtain dishonestly grades, honors, awards, or professional endorsement; altering, forging, or misusing a University academic record; or fabricating or falsifying data, research procedures, or data analysis. If it is determined that a student has cheated, the student may be given an "F" or an "N" for the course, and may face additional sanctions from the University. For additional information, please reference the guidelines for instructor responsibilities.

The Office for Community Standards has compiled a useful list of Frequently Asked Questions pertaining to scholastic dishonesty. If you have additional questions, please clarify with your instructor for the course. Your

instructor can respond to your specific questions regarding what would constitute scholastic dishonesty in the context of a particular class, e.g., whether collaboration on assignments is permitted, requirements and methods for citing sources, if electronic aids are permitted or prohibited during an exam.

Makeup Work for Legitimate Absences: Students will not be penalized for absence during the semester due to unavoidable or legitimate circumstances. Such circumstances include verified illness, participation in intercollegiate athletic events, subpoenas, jury duty, military service, bereavement, and religious observances. Such circumstances do not include voting in local, state, or national elections. For complete information, please see the policy on makeup work.

Appropriate Student Use of Class Notes and Course Materials: Taking notes is a means of recording information but more importantly of personally absorbing and integrating the educational experience. However, broadly disseminating class notes beyond the classroom community or accepting compensation for taking and distributing classroom notes undermines instructor interests in their intellectual work product while not substantially furthering instructor and student interests in effective learning. Such actions violate shared norms and standards of the academic community. For additional information, please reference the guidelines for student responsibilities.

University Grading Scales: The University has two distinct grading scales: A-F and S-N.

A-F grading scale: The A-F grading scale allows the following grades and corresponding GPA points:

Grade	GPA Points	Definitions for undergraduate credit
A	4.000	Represents achievement that significantly exceeds expectations in the course.
A-	3.667	
B+	3.333	
B	3.000	Represents achievement that is above the minimum expectations in the course.
B-	2.667	
C+	2.333	
C	2.000	Represents achievement that meets the minimum expectations in the course.
C-	1.667	
D+	1.333	
D	1.000 -	Represents achievement that partially meets the minimum expectations in the course. Credit is earned but it may not fulfill major or program requirements.
F	0.000	Represents failure in the course and no credit is earned

S-N grading scale: The S-N grading scale allows for the following grades and corresponding GPA points:

Grade	GPA Points	Definitions for undergraduate credit
S	0.00	Satisfactory (equivalent to a C- or better)
N	0.00	Not Satisfactory

For additional information, please refer to the policy on grading and transcripts.

Sexual harassment, sexual assault, stalking and relationship violence: The University prohibits sexual misconduct, and encourages anyone experiencing sexual misconduct to access resources for personal support and reporting. If you want to speak confidentially with someone about an experience of sexual misconduct, please contact your campus resources including the Aurora Center, Boynton Mental Health or Student Counseling Services. If you want to report sexual misconduct, or have questions about the University's policies and procedures related to sexual misconduct, please contact your campus Title IX office or relevant policy contacts.

Instructors are required to share information they learn about possible sexual misconduct with the campus Title IX office that addresses these concerns. This allows a Title IX staff member to reach out to those who have experienced sexual misconduct to provide information about personal support resources and options for investigation. You may talk to instructors about concerns related to sexual misconduct, and they will provide support and keep the information you share private to the extent possible given their University role. For more information, please refer to the policy on sexual harassment, stalking, and relationship violence.

Equity, Diversity, Equal Opportunity, and Affirmative Action: The University provides equal access to and opportunity in its programs and facilities, without regard to race, color, creed, religion, national origin, gender, age, marital status, disability, public assistance status, membership or activity in a local commission created for the purpose of dealing with discrimination, veteran status, sexual orientation, gender identity, or gender expression. For more information, please consult the Board of Regents Policy.

Disability Accommodations: The University views disability as an important aspect of diversity, and is committed to providing equitable access to learning opportunities for all students. The Disability Resource Center (DRC) is the campus office that collaborates with students who have disabilities to provide and/or arrange reasonable accommodations.

- If you have, or think you have, a disability in any area such as, mental health, attention, learning, chronic health, sensory, or physical, please contact the DRC office on your campus (UM Twin Cities - 626.1333) to arrange a confidential discussion regarding equitable access and reasonable accommodations.
- Students with short-term disabilities, such as a broken arm, can often work with instructors to minimize classroom barriers. In situations where additional assistance is needed, students should contact the DRC as noted above.
- If you are registered with the DRC and have a disability accommodation letter dated for this semester or this year, please contact your instructor early in the semester to review how the accommodations will be applied in the course.
- If you are registered with the DRC and have questions or concerns about your accommodations please contact your (access consultant/disability specialist).

Additional information:

Crookston - https://www.crk.umn.edu/units/disability-resource-center, myers062@crk.umn.edu
Duluth - http://www.d.umn.edu/disability-resources, access@d.umn.edu
Morris - http://www.morris.umn.edu/academicsuccess/disability/, hoekstra@morris.umn.edu
Rochester - http://r.umn.edu/student-life/student-services/disability-resources, sdzavada@r.umn.edu
Twin Cities - https://diversity.umn.edu/disability/, drc@umn.edu)

Mental Health and Stress Management: As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance and may reduce your ability to participate in daily activities. University services are available to assist you. You can learn more about the broad range of confidential mental health services available on campus via the Student Mental Health Website.

Academic Freedom and Responsibility: Academic freedom is a cornerstone of the University. Within the scope and content of the course as defined by the instructor, it includes the freedom to discuss relevant matters in the classroom. Along with this freedom comes responsibility. Students are encouraged to develop the capacity for critical judgment and to engage in a sustained and independent search for truth. Students are free to take reasoned exception to the views offered in any course of study and to reserve judgment about matters of opinion, but they are responsible for learning the content of any course of study for which they are enrolled.*

Reports of concerns about academic freedom are taken seriously, and there are individuals and offices available for help. Contact the instructor, the Department Chair, your adviser, the associate dean of the college, or the Vice Provost for Faculty and Academic Affairs in the Office of the Provost (reach out to me for these contacts).

* Language adapted from the American Association of University Professors "Joint Statement on Rights and Freedoms of Students".

CHEN 201 Syllabus Rationale

Objectives and Alignment

The objectives of this course focus on the students' growth as engineers and aim to help students decide if chemical engineering is the field for them. They will gain foundational skills to solve chemical engineering problems, but more importantly, will get a taste for engineering problem solving and critical thinking. They will also be exposed to a wide variety of chemical engineering disciplines and will become aware of a diverse range of current, notable chemical engineers. As such, they will practice solving mass and energy balance problems (the foundation of chemical engineering calculations) in structured homework assignments as well as ungraded weekly in-lecture activities. They will be assessed on this skill in midterm exams to reinforce their knowledge. The final project will them allow them to use their STEAM (science, technology, engineering, art, and math) capabilities to design their own process inspired by a notable chemical engineer. This final project will be a summative assessment of their problem-solving skills and will provide them an opportunity to explore the careers of current chemical engineers. Not only will they explore these careers, but they will also (hopefully) see themselves reflected in these engineers as they narrow their own career interests.

Assessments

To balance both formative and summative assessments, this course includes exams, weekly ungraded quizzes, and a final project as grading mechanisms. The students will be able to excel in the format that will suit them best given the time and resource limitations of both the instructor and the course. The weekly ungraded quizzes will be designed to prepare the students for the types of problems they will have to solve on their exams and will also provide a space for them to provide class feedback or comment on any of their needs. The final project is a summative assessment that includes a formative assessment in its progression (peer review). The final project will require students to explore notable chemical engineers from a variety of backgrounds in myriad fields, from consumer goods to pharmaceutics. Hopefully, they will learn about the career opportunities for them and will discover that chemical engineers can make a positive impact in almost every field. This assignment will also give them the framework to start picturing themselves in these roles.

Grading Strategy

This course focuses more on homework assignments and the final project over the midterm exams, thus shifting the stress away from rigidly timed assessments. The homework assignments have the heaviest weight as the solutions will be provided to the students 24 hours prior to the submission deadline, so they should have the opportunity to get higher scores. The lowest two scores will also be dropped should a student not have the time to submit a homework assignment that week or struggled with the material. The next largest portion of their grade is the final project, which will be graded based on effort and not on accuracy. I will not prioritize whether the process they designed is effective, but instead will prioritize that they provided a creative design inspired by current processes. The peer review portion of the final project will also be graded so the students will be exposed to the rubric-grading style. Next, there will be three midterm exams, but the lowest midterm grade will not be included in the final grade calculation; each scored exam will be worth 10% of the grade. The lowest scores will be dropped should a student need to miss an exam or just has a particularly bad day. The students will also get two "freebie" weeks to mix the ungraded lecture activities (participation grade) as these activities will occur later in the week, which might conflict with conferences, visits home, or other needs.

Teaching Strategy

By using both lectures and in-class problem-solving, this course will use active learning techniques in addition to the traditional pedagogical style in chemical engineering classrooms. The in-class problem-solving exercises will be centered on case studies so the students will be exposed to realistic processes (there will not be a problem like "Timmy purchases 20 watermelons and eats 5; how many does he have left?). Through multiple choice polls, group problem-solving, and ungraded lecture quizzes, the course will be more interactive than traditional chemical engineering classrooms.

Areas of Resistance

The final project may receive pushback from students who do not value diversity and inclusion in the classroom, or who believe that the field is diverse enough. The final project allows them to feature any chemical engineer of their choosing, so they can choose to feature a cis, white, able-bodied, man engineer if they so choose. They will not be graded on how diverse their featured engineer is. I will reinforce the fact that if other students choose to feature diverse engineers, it is their choice to do so, not a requirement. I hope that this will passively expose those who are resistant to DEI implementations to a broader range of engineers. The peer review rubric will also be designed such that the students are evaluating each others' processes, not each others' choice of featured engineer.

Diversity Statement

As an engineer with intersecting marginalized identities, I am keenly aware of the power instructors have to either bolster or stymie career aspirations in STEM fields. As such, I have made consistent efforts to encourage minoritized students to stay true to their career goals both inside and outside the classroom and will continue to do so throughout my academic career.

Since my freshman year, I have been extensively involved with the Society of Women Engineers (SWE). Motivated to boost the representation of underrepresented genders in engineering, I served multiple leadership positions as an undergraduate student and am continuing to contribute to the organization on a societal level as a graduate student. However, I noted that SWE's membership is predominantly white; I have consciously worked to spotlight and support its members of color. As a reporter for SWE's high school newsletter, I featured engineers across a broad range of fields every month to share their career paths and provide advice for high school students interested in these fields. I made a conscious effort to feature diverse engineers as this visibility was lacking in previous newsletters. Considering racial, gender, and neurodiversity, I worked to expand the image of what an engineer "should" look like. I aim to bring this same visibility to my future classrooms by consciously highlighting the works of a diverse range of engineers.

Furthermore, I have held leadership positions in the SWE Asian Connections Affinity Group (ACAG). As both the Community Lead and the Culture and Heritage Lead, I held safe spaces for members to connect and to support each other through adversity while celebrating their identities. The highlight of my work was a virtual community forum for our members to support each other after the 2021 Atlanta Shootings. I established collaborative ground rules for discussion and ensured that participants felt safe to share both their fears and hopes. This event solidified the community I contributed to in the ACAG and also taught me that we bring our whole selves into the spaces we occupy. It is impossible to isolate identities and we should honor the pride and the pain our identities bring. After future global events, I will strive to check in with my students, honor their identities, and provide them with the necessary space to grow in their authentic selves. My experience in facilitating intersectional spaces has not only prepared me to mindfully build community in my future classrooms but has also fortified my own identity as an intersectional engineer.

As a graduate student, I also dedicate time to my passions of outreach and advocacy. Leaning on my extensive outreach experience from my undergraduate career, I serve as the Webmaster for Science for All, a middle school STEM outreach group. As Webmaster, I aim to provide transparency and accessibility on our website for those outside of the Twin Cities to replicate our lessons and continue encouraging historically excluded groups to pursue STEM interests. This work has also informed me of digital accessibility measures I can implement in my future classes, including inclusive presentation design and link sharing. Furthermore, I am my cohort's representative in our department's Graduate Student Committee (GSC). As a member of the GSC, I aim to build programs and policies to support graduate student well-being and increase retention. I hope to dismantle the "hidden curriculum" by advocating for graduate student needs and providing clear resources to overcome obstacles around major milestones, such as the preliminary exam. My practice in advocating for my fellow graduate students will carry forward as I advocate for my students' needs, especially for undergraduate students who are navigating academic spaces for the first time and might not know how to articulate their needs just yet. In my future classrooms, I aspire to bring the same values of transparency, advocacy, and compassion to my teaching and interactions with my students.