

CHE 485: Computer-Aided Chemical Process Design
Units: 4
Fall 2024

Location: MHPB7B

Instructor: Pin Wang

Office: RTH 506

Office Hours: Thursday at 12-1pm via zoom

Contact Info: pinwang@usc.edu (preferred)

Teaching Assistant: TBD

Office Hours: TBD

Contact Info: TBD

Course Producer: TBD

Office Hours: TBD

Contact Info: TBD

Course Producer: TBD

IT Help: Viterbi IT Services

Hours of Service: Normal: M-F 8a to 5p

Other time limited to server and
infrastructure support

Contact Info: email: engrhelp@usc.edu

Phone: 213-740-0517

Walk-in: DRB-205

Course Description

First of two process and plant design courses taken by Chemical Engineering seniors. The students will integrate the concepts and skills developed in the core chemical engineering curriculum using modern computer design software to simulate and design chemical process unit operations. The initial focus is on simulation and design of individual unit operation that builds until students are simulating and designing unit operation that function together as manufacturing process. Students will be asked to make equipment and process design recommendations based on the simulation results and design calculations.

Learning Objectives

- Simulate individual unit operations and manufacturing process using computer tools.
- Design process equipment/unit operations using computer-based flow-sheeting programs, spreadsheets and manual calculations.
- Recommend equipment designs and process designs based on these simulations and design calculations. These recommendations require that student master writing executive summary memos coupled with providing results of their simulations and design calculations to justify their recommendations.

Specific unit operations that students will be able to simulate and do preliminary design calculations for include:

- Pumps, Compressors, Expanders
- Heat Exchangers
- Boilers and Fired Heaters
- Chemical Reactors
- Flash Separators, Liquid/Liquid Separators, Distillation Columns
- Absorber/Stripper Systems including Dryers
- Solids Handling Equipment

Prerequisite(s): CHE 442 and CHE 443

Co-Requisite(s): none

Concurrent Enrollment: none

Course Notes

Grading is by letter grade. Course information is distributed via Blackboard and via email. Typically, assignments are submitted electronically with requirements specified in the assignment.

Technological Proficiency and Hardware/Software Required

The course will be taught both in-person. If the instructor is unable to attend in-person for health concerns, the lectures will be done on ZOOM. Students will need to be able to access materials from Blackboard and use materials available on-line through the USC Library. Some parts of lectures, specifically software tutorials/demos will be recorded. Blackboard will be used to communicate, post materials to be used by students in the course, and for the instructor to communicate to the class. Outside of lecture, it is preferable to use SLACK to ask questions – the TA, Course Producer, and Instructor will monitor Slack and try to respond. The instructor will also post questions and answers asked by students that may be of general interest to the entire class on SLACK.

Additionally, the students will need to use AVEVA Simulation and Excel as well as potentially MATLAB and SuperPro Design (or similar process simulation/design software). AVEVA Simulation is available on the Viterbi MyDesktop (VDI). It is also possible that student may want to use Microsoft Visio as part of their work also available on Viterbi MyDesktop.

USC Technology Support Links

[Zoom information for students](#)

[Blackboard help for students](#)

[Software available to USC Campus](#)

Required Readings and Supplementary Materials

The course textbook is

Gavin Towler, **Chemical Engineering Design: Principles, Practice and Economics of Plant and Process Design**, (3rd Edition), Butterworth-Heinemann, (2021), ISBN 0-12-821179-2.

Students may also find the following resources useful (available on-line at USC Libraries):

Couper, Penney and Fair; **Chemical Process Equipment Selection and Design** (3rd Edition), Elsevier, Amsterdam (2012) ISBN (print) 9780123969590 (ebook) 9780123972361.

Green and Perry; **Perry's Chemical Engineer's Handbook**

Turton and Shaeiwitz; **Chemical Process Equipment Design** (1st edition), Prentice Hall (2017), ISBN-13: 978-0133804478.

Description and Assessment of Assignments

The course will have two mid-term exams (cumulative). While the instructor reserves the right to change how exams will be taken mid-semester, all exams are conducted in a closed book setting with a calculator (not phone and not computer/laptop) and one 8.5x11 page of notes.

Additionally, students evaluated through typically six projects assigned during the semester with the final project being due at the time of final exam. Each project requires that that use computer software to solve chemical engineering design and simulation problems. Student's work is evaluated on based on the ability to correctly solve the problems and make recommendations/decisions based on these results. Assignments to a project near the end of the semester that requires students to simulate an entire process flow sheet and do design calculations for the equipment in the flow sheet.

While there may be some recommended reading, the projects are typically the only course work assigned to be done outside of lecture. The instructor will provide the students with references that they can use to solve the problems in the projects, but students are expected to self-study, developing their life-long learning skills as part of the projects.

Finally, students are asked to do some smaller in-class assignments or workshops. These exercises are graded on a credit/no credit basis and cannot be made up without prior discussion with the instructor. PLEASE BRING A 8.5X11 SHEET of PAPER to every lecture so that you can turn in these exercises for credit.

Grading Breakdown

Projects (typically 6):	60%
Final full plant simulation project:	20%
Class Workshops/Participation:	20%

We will work many more “workshops” in class than will be considered in grading since working problems (workshops) has been demonstrated to be an effective learning tool. While not announce ahead of time, it will be clear in lecture which in-class activities will need to be submitted for credit.

Assignment Submission Policy

Late submissions will not be accepted because solutions will be posted after the submission time. Students are **encouraged** to contact the instructor or TAs with reasonable requests for changes to the due date. These requests will not be acceptable last minute or after the due date. The instructor or TAs will decide whether a modified due date will be accepted and with what penalty.

All student submissions must be professionally prepared with the author(s) clearly identified, answers clearly and completely presented, and final results and conclusions clearly identified. Points will be deducted for unprofessional preparation.

Assignments will be submitted electronically through GradeScope and email. The details will for the electronic submission will be provided on Blackboard. For assignment, you will create an executive summary. The assignment requirements will be specified in the assignment. Assignments must be neatly presentable and easy to understand and evaluate. Work that is difficult to read or poorly presented in the opinion of the instructor will not be graded. While it is expected that students will discuss the projects, all work submitted should be the student’s own work product and not a collaborative group effort.

Grading Timeline

Every effort is made to provide feedback within 10 days of when the assignment is submitted.

Classroom Norms

As course instructor

- I will come prepared to present the material for the course and work problems in lecture to assist students in learning.
- I will make the effort to learn everyone’s name – this is a challenge and will be more so with remote lectures/office hours.
- I will respect all questions asked by students, but I may reserve the right to ask to answer questions later. I recognize that you have many competing priorities and will not hold it against you if you are not able to attend class upon occasions with good reasons.
- If I don’t know the answer, I will not try to pretend that I do, and I will get back with you with a thoughtful answer.
- I will attempt to provide a diverse learning environment so that student with different learning styles can be successful in the course.
- I do set high standards because I want to see each student succeed in the course and as an engineer.

As students,

- I expect that you will make a solid effort in the course. This means attending lectures, coming to prepared for lecture having watched/read the preparation materials,

participating in lecture discussions, and attempting to do the workshops, submitting your own work product.

- I do not judge students based on their questions so you should ask questions to clarify your understanding of the material.
- While I understand grades are important, understand the material and being able to use the material should be every student's goal. This understanding means more than just knowing the formula/math to solve problems.
- I also expect you to respect your fellow students, contributing equally to group work (don't hitchhike on assignments, workshops, or laboratories).
- If other students are waiting to ask questions when you are having significant problems understanding the material, try to be respectful of their time and consider asking for different time to ask more extensive questions.

Finally, if you think I don't know your name or am pronouncing it wrong, help me by letting know what you want to be called and how to pronounce it. Also, if you have a concern, I ask that you approach me and we will work through and attempt to mutually resolve your concern.

Bottom line, my goal is to see each of you be successful students and, in the future, engineers. I would like is a course to provide a respectful and open environment for learning.

Attendance

As seniors, the students are expected to make their own choices about attending lectures. Missed in-lecture workshops/exercises cannot be made-up.

Academic integrity and Professional Ethics

Professional behavior will be an essential aspect of your engineering career. You have been observing an important standard for ethical behavior since joining USC. We will continue to observe the academic integrity policies in this course.

*The School of Engineering and the Department of Chemical Engineering adhere to the University's policies and procedures governing academic integrity as described in SCampus. Students are expected to be **aware** of and **observe** the academic integrity standards described in SCampus.*

As engineers you will be professionals expected uphold the profession behavior set out by the National Society of Professional Engineers and AIChE. You can find the ethical code of conduct statements at the NSPE and AIChE websites – you should consider reading them.

Sharing Course Materials Outside of the Learning Environment

USC has a policy that prohibits sharing of any synchronous and asynchronous course content outside of the learning environment.

SCampus Section 11.12(B)

Distribution or use of notes or recordings based on university classes or lectures without the express permission of the instructor for purposes other than individual or group study is a violation of the USC Student Conduct Code. This includes, but is not limited to, providing materials for distribution by services publishing class notes. This restriction on unauthorized use also applies to all information, which had been distributed to students or in any way had been displayed for use in relationship to the class,

whether obtained in class, via email, on the Internet or via any other media. (See Section C.1 Class Notes Policy).

Statement on Academic Conduct and Support Systems

Academic Conduct:

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Part B, Section 11, “Behavior Violating University Standards” policy.usc.edu/scampus-part-b. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on scientific misconduct, policy.usc.edu/scientific-misconduct.

Support Systems:

Counseling and Mental Health - (213) 740-9355 – 24/7 on call studenthealth.usc.edu/counseling

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

National Suicide Prevention Lifeline - 1 (800) 273-8255 – 24/7 on call suicidepreventionlifeline.org

Free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week.

Relationship and Sexual Violence Prevention Services (RSVP) - (213) 740-9355(WELL), press “0” after hours – 24/7 on call studenthealth.usc.edu/sexual-assault

Free and confidential therapy services, workshops, and training for situations related to gender-based harm.

Office of Equity and Diversity (OED) - (213) 740-5086 | *Title IX* – (213) 821-8298 equity.usc.edu, titleix.usc.edu

Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

Reporting Incidents of Bias or Harassment - (213) 740-5086 or (213) 821-8298 usc-advocate.symplicity.com/care_report

Avenue to report incidents of bias, hate crimes, and microaggressions to the Office of Equity and Diversity | Title IX for appropriate investigation, supportive measures, and response.

The Office of Disability Services and Programs - (213) 740-0776 dsp.usc.edu

Support and accommodations for students with disabilities. Services include assistance in providing readers/notetakers/interpreters, special accommodations for test taking needs, assistance with architectural barriers, assistive technology, and support for individual needs.

USC Campus Support and Intervention - (213) 821-4710 campussupport.usc.edu

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

Diversity at USC - (213) 740-2101 diversity.usc.edu

Information on events, programs and training, the Provost’s Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

USC Emergency - UPC: (213) 740-4321, *HSC:* (323) 442-1000 – 24/7 on call dps.usc.edu, emergency.usc.edu

Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

USC Department of Public Safety - UPC: (213) 740-6000, HSC: (323) 442-120 – 24/7 on call dps.usc.edu
Non-emergency assistance or information.