

MEMORANDUM FOR STUDENTS ENROLLED IN CHEN 4170 – Section 01

SUBJECT: CHEN 4170 – Chemical Plant Design I - Administrative Instructions

Lecture times: Mo/We 11:15 am – 12:15 pm, Tu 2:00 pm – 3:00 pm

Office Hours: RBN 2043, Tu/Th 12:30 pm – 2:00 pm

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Welcome to CHEN 4170: Chemical Plant Design I. This course is the first part of the senior capstone design sequence and provides students with the opportunity to integrate and apply concepts learned throughout the chemical engineering curriculum to the design of a chemical process plant.

In this course, students will use engineering principles, project evaluation methods, and decision-making tools to design a new chemical facility based on a process assigned by the instructors. Students will be expected to apply prior knowledge, exercise creativity, and think critically to solve engineering problems related to process development, equipment design, and facility design. Course lectures will include reviews of relevant topics from previous courses as well as the introduction of new concepts needed to support the assigned design project.

Throughout the semester, writing assignments and project deliverables will help students document their progress, communicate technical information effectively, and remain on track with the design process. CHEN 4170: Chemical Plant Design I focuses on the selection of a process concept, evaluation of process alternatives, and preliminary sizing of major process components. Students who successfully complete this course will be prepared to continue to CHEN 4371: Chemical Plant Design II, the final senior capstone course in the chemical engineering program.

In CHEN 4371, students will further develop the design by completing more detailed equipment sizing, performing process optimization, conduct techno-economic assessment, and evaluate environmental impacts. Therefore, the complete capstone design experience progresses from process concept selection to final design evaluation.

CHEN 4170 Plant Design Course Objectives:

1. Develop a simple project execution plan to design and construct a chemical process facility based on needs specified by a client;
2. Develop a set of diagrams intended to represent the design of a chemical plant. The diagrams should increase in complexity to provide guidance for the following steps;
3. Initiate the design of the components of the process, including selection of equipment and materials of construction;
4. Work effectively in teams;

5. Employ process design softwares to aid in calculations;
6. Develop communication skills via written reports and debrief meetings;
7. Achieve 25 % completion of the final design plans

Mode of delivery: This is a face-to-face course, and regular attendance is required. Because this course includes extensive group work, in-class collaboration, and activities that are essential to meeting the course learning outcomes, attendance is especially important.

Students must attend at least 90% of scheduled class meetings to successfully complete the course. Absences recognized under university policy or otherwise approved by the instructor as justified absences will not count against this requirement. Students who fall below the 90% attendance requirement, excluding excused or approved absences, may be unable to demonstrate required course outcomes and may not receive a passing grade for the course.

Students are responsible for notifying the instructor as early as possible regarding any absence and for arranging makeup or equivalent work when applicable.

1. The course has one prerequisite which must be completed successfully prior to taking this course:

- ✓ CHEN 3340 (Heat Transfer)

It also has two co-requisites that must be taken simultaneously:

- ✓ CHEN 4310 (Separation Processes), CHEN 4330 (Process Control and Safety)

2. The goal of our faculty is to be commonly available to you for assistance, so you are encouraged and expected to seek **additional instruction**. Take advantage, it is FREE and really will help! There are several ways you can seek additional instruction:

- ✓ You are welcome to stop by the instructor's office at any time. However, for your own satisfaction, you can ensure the instructor is available at the office by using the following options:
- ✓ Come to Office hours. This is the time the instructor has set aside to answer your questions;
- ✓ E-mail or call the instructor to set up a mutually agreeable time to meet with the instructor,
- ✓ E-mail your questions to the instructor (this is the least preferred option because of the limited effectiveness of e-mail communication), but it is acceptable if other options are not possible.

3. Use of Artificial Intelligence (AI) in course assignments:

In this class, generative *AI is permitted only for limited learning-support purposes* and only within the boundaries described below.

Students may use generative AI tools, such as ChatGPT, Microsoft Copilot, to support their learning outside of submitted work. Appropriate uses include asking conceptual questions, reviewing background information, searching for explanations of course-related topics, clarifying difficult concepts, generating practice questions for self-study, or obtaining help understanding general engineering concepts.

However, students may not use generative AI tools to generate, rewrite, revise, polish, paraphrase, translate, or edit any content submitted for credit in this course. Submitted work must reflect the student's own understanding, analysis, calculations, writing, and professional judgment. This applies to all project related tasks, writing assignments, written and oral reports.

Any use of generative AI to produce or modify submitted assignment content may be treated as a violation of UT Tyler's Honor Code and academic honesty expectations.

4. Class Room Procedures:

- a. Bring study notes, textbooks, note-taking material, and calculator to every class. You may not borrow or exchange calculators during graded events. Class preparation is your individual responsibility.

- b. *Textbooks:*

Analysis, Synthesis, and Design of Chemical Processes; Turton, Whiting, Shaeiwitz, 5th Edition. (TWS).

Welty, J.R.; Rorrer, G.; Foster, D.G.; "Fundamentals of Momentum, Heat, and Mass Transfer", John Wiley & Sons, New York, 2014, 6th Edition (WRF).

Theodore L. Bergman, Adrienne S. Lavine, Frank P. Incropera, David P. Dewitt, Fundamentals of Heat and Mass Transfer, 7thEd., John Wiley & Sons, 2011 (BLID).

Optional:

McCabe, Smith, and Harriott: "Unit Operations of Chemical Engineering", 7th edition. McGraw-Hill Inc. (2005) (MS)

Transport Processes and Separation Process Principles", 4th ed., Geankoplis, Prentice Hall, 2003. (G)

- c. *Process Simulation Tool:* Students can use software packages to assist with the modelling and optimization of the design. Promax is the recommended package for this purpose.

- d. Engineering Design Problem:

This course includes a semester long design problem with several written submissions. The design problem requires students to demonstrate the following abilities:

- 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.

5. Evaluations:

- a. *ACADEMIC DISHONESTY:* Representation of other's work as your own will not be tolerated. Cheating on examinations, quizzes, reports, and homework and the false representation of work will be interpreted as academic dishonesty. Academic dishonesty will be subject to disciplinary action as outlined by the UT Tyler Student Guide on Conduct and Discipline.
- b. *Writing Assignments:* As part of the progression of coursework, students will be required to submit writing assignments on a regular basis. For each writing assignment, the class/project team is expected to submit one single, unified document that integrates the contributions from all three groups. These writing assignments are intended to help students progressively develop the content that will later be included in the 10% and 25% project reports. Writing assignments will typically be due on Wednesdays.
- c. **Late Submissions.** It is a basic principle of professionalism that **“Professionals are not Late.”** A “COORDINATED LATE” submission occurs when you will miss the due date for a graded assignment and you contact me in advance. Notification immediately before the submission will not suffice. Point cuts up to the amounts below may be assessed for a “COORDINATED LATE” submission:

1. 0-24 hours late	a deduction of 25% of the earned grade
2. 24-48 hours late	a deduction of 50% of the earned grade
3. More than 48 hours late	No credit.

Obviously, there are circumstances that may occur and make a timely submission impossible and I will work with you when and if they occur.

- d. *Leadership:* For each assignment during the semester, groups will be assigned leaders which will be responsible to oversee the project. At the delivery of the milestone, leaders will assign grades to each of the group members based on their contributions to the project. Likewise, members of the team will grade the leader on leadership skills. These peer

evaluations will constitute 25 % of the Leadership grade. The remaining 75 % will be assigned by the Instructors, based on the following observations:

- Attendance in class and punctuality;
- Engagement in class, asking questions about the material and answering questions from the instructor;
- Demonstration of initiative to work on problems, actively participating in the discussions;
- Asking questions outside class: after class, during office hours, and by e-mail;
- Any other factors that may contribute to the instructor's perception of a student contribution to the project

e. Sustainability Surveys

The design project will heavily emphasize environmental considerations in chemical plant design. As part of this focus, students will be required to complete two Sustainability Surveys. The first survey will be administered early in the semester to assess baseline understanding and attitudes toward sustainable engineering practices. The second survey will be completed after several key assignments and project milestones, allowing students to reflect on how their design decisions have evolved in response to environmental, economic, and social factors. These surveys are intended to foster awareness of sustainability principles and will contribute to the course evaluation.

6. Grading:

Grades will be based entirely on the student's demonstrated ability to develop detailed, neat, organized, and correct solutions to the problems presented. Correct answers accompanied by incorrect, incomplete, or untidy solutions may receive no credit.

Grade Distribution

Writing assignments (6 at 5 points each)	30 (30 %)
Preliminary Individual Presentations (12 points total)	12 (12 %)
10 % Design Report (12 points total)	12 (12 %)
10 % Leadership (8 points total)	8 (8 %)
25 % Design Presentation (12 points total)	12 (12 %)
25 % Design Written Report (16 points total)	16 (16 %)
25 % Leadership (8 points total)	8 (8 %)
Sustainability Surveys (2 points total)	2 (2 %)

Total 100 (100%)

Most assignments in this course will be completed as group projects. However, grades remain individual, and each student is expected to contribute meaningfully to the group's work. For group submissions, the instructor will assign a baseline grade based on the quality of the submitted assignment. Individual grades may then be adjusted upward or downward using contribution

multipliers or other evaluation methods to reflect each student's demonstrated contribution to the project. Evidence used to determine individual contribution may include peer evaluations, instructor observations, project documentation, and individual discussions with the instructor. Accordingly, students in the same group may receive different grades for the same group assignment.

Grade Scale based on points

Higher than 85 points	A
Between 70 and 85 points	B
<i>Between 60 and 70 points</i>	<i>C</i>
Between 30 and 60 points	D
Less than 30 points	F

You need at least 60 points total to pass the course with a C grade and advance to CHEN 4371 (Chemical Plant Design II) in the Spring semester.

7. Collection of Student Work:

Throughout the semester I will collect student work (strong, average, and poor) for the ABET course and outcomes notebooks. This will require me to make a copy of your work, keep your original and return a copy of the graded work to you. I will not draw attention as to what level of work you accomplished.

8. Assigned readings:

The class schedule will include assigned reading for every lecture. Students who read the corresponding sections of the book *before each class* will certainly make the most of the lectures, so this is highly recommended. In addition, the instructor will periodically post the lecture notes on the course website. Doing the assigned reading prior to class will help you to understand the material presented during the instruction and will fill in gaps for things we do not cover (***I will not cover everything***). It will also make you more familiar with terms and concepts to be covered.

9. **UT Tyler Honor Code** – Students are expected to abide by UT Tyler's Honor Code: "I embrace honor and integrity. Therefore, I choose not to lie, cheat, or steal, nor to accept the actions of those who do."

10. **Students Rights and Responsibilities:** To know and understand the policies that affect your rights and responsibilities as a student at UT Tyler, please review the **Student Responsibilities** section of the UT Tyler Catalog: <https://uttyler.smartcatalogiq.com/en/2025-2026/catalog/student-success/student-responsibilities/>.

11. **Campus Carry** - We respect the right and privacy of students 21 and over who are duly licensed to carry concealed weapons in this class. License holders are expected to behave responsibly and keep a handgun secure and concealed. More information is available at <http://www.uttyler.edu/about/campus-carry/index.php>.

12. UT Tyler a Tobacco-Free University - All forms of tobacco will not be permitted on the UT Tyler main campus, branch campuses, and any property owned by UT Tyler. This applies to all members of the University community, including students, faculty, staff, University affiliates, contractors, and visitors. Forms of tobacco not permitted include cigarettes, cigars, pipes, water pipes (hookah), bidis, kreteks, electronic cigarettes, smokeless tobacco, snuff, chewing tobacco, and all other tobacco products. There are several cessation programs available to students looking to quit smoking, including counseling, quitlines, and group support. For more information on cessation programs please visit www.uttyler.edu/tobacco-free.

13. Grade Replacement/Forgiveness and Census Date Policies - Students repeating a course for grade forgiveness (grade replacement) must file a Grade Replacement Contract with the Enrollment Services Center (ADM 230) on or before the Census Date of the semester in which the course will be repeated. Grade Replacement Contracts are available in the Enrollment Services Center or at <http://www.uttyler.edu/registrar>. Each semester's Census Date can be found on the Contract itself, on the Academic Calendar, or in the information pamphlets published each semester by the Office of the Registrar. Failure to file a Grade Replacement Contract will result in both the original and repeated grade being used to calculate your overall grade point average. Undergraduates are eligible to exercise grade replacement for only three course repeats during their career at UT Tyler; graduates are eligible for two grade replacements. Full policy details are printed on each Grade Replacement Contract. The Census Date is the deadline for many forms and enrollment actions of which students need to be aware. These include:

- Submitting Grade Replacement Contracts, Transient Forms, requests to withhold directory information, approvals for taking courses as Audit, Pass/Fail or Credit/No Credit.
- Receiving 100% refunds for partial withdrawals. (There is no refund for these after the Census Date)
- Schedule adjustments (section changes, adding a new class, dropping without a "W" grade)
- Being reinstated or re-enrolled in classes after being dropped for non-payment
- Completing the process for tuition exemptions or waivers through Financial Aid

14. State-Mandated Course Drop Policy - Texas law prohibits a student who began college for the first time in Fall 2007 or thereafter from dropping more than six courses during their entire undergraduate career. This includes courses dropped at another 2-year or 4-year Texas public college or university. For purposes of this rule, a dropped course is any course that is dropped after the census date (See Academic Calendar for the specific date). Exceptions to the 6-drop rule may be found in the catalog. Petitions for exemptions must be submitted to the Enrollment Services Center and must be accompanied by documentation of the extenuating circumstance. Please contact the Enrollment Services Center if you have any questions.

15. Disability/Accessibility Services - In accordance with Section 504 of the Rehabilitation Act, Americans with Disabilities Act (ADA) and the ADA Amendments Act (ADAAA) the University of Texas at Tyler offers accommodations to students with learning, physical and/or psychological disabilities. If you have a disability, including a non-visible diagnosis such as a learning disorder, chronic illness, TBI, PTSD, ADHD, or you have a history of modifications or accommodations in a previous educational environment, you are encouraged to visit

<https://hood.accessiblelearning.com/UTTyler> and fill out the New Student application. The Student Accessibility and Resources (SAR) office will contact you when your application has been submitted and an appointment with Cynthia Lowery, Assistant Director of Student Services/ADA Coordinator. For more information, including filling out an application for services, please visit the SAR webpage at <http://www.uttyler.edu/disabilityservices>, the SAR office located in the University Center, # 3150 or call 903.566.7079.

16. Student Absence due to Religious Observance - Students who anticipate being absent from class due to a religious observance are requested to inform the instructor of such absences by the second class meeting of the semester.

17. Student Absence for University-Sponsored Events and Activities - Revised 05/19 If you intend to be absent for a university-sponsored event or activity, you (or the event sponsor) must notify the instructor at least two weeks prior to the date of the planned absence. At that time the instructor will set a date and time when make-up assignments will be completed.

18. Social Security and FERPA Statement - It is the policy of The University of Texas at Tyler to protect the confidential nature of social security numbers. The University has changed its computer programming so that all students have an identification number. The electronic transmission of grades (e.g., via e-mail) risks violation of the Family Educational Rights and Privacy Act; grades will not be transmitted electronically.

19. Emergency Exits and Evacuation - Everyone is required to exit the building when a fire alarm goes off. Follow your instructor's directions regarding the appropriate exit. If you require assistance during an evacuation, inform your instructor in the first week of class. Do not re-enter the building unless given permission by University Police, Fire department, or Fire Prevention Services.

20. Student Standards of Academic Conduct - Disciplinary proceedings may be initiated against any student who engages in scholastic dishonesty, including, but not limited to, cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts.

i. "Cheating" includes, but is not limited to:

- copying from another student's test paper;
- using, during a test, materials not authorized by the person giving the test;
- failure to comply with instructions given by the person administering the test;
- possession during a test of materials which are not authorized by the person giving the test, such as class notes or specifically designed "crib notes". The presence of textbooks constitutes a violation if they have been specifically prohibited by the person administering the test;
- using, buying, stealing, transporting, or soliciting in whole or part the contents of an unadministered test, test key, homework solution, or computer program;
- collaborating with or seeking aid from another student during a test or other assignment without authority;

- discussing the contents of an examination with another student who will take the examination;
- divulging the contents of an examination, for the purpose of preserving questions for use by another, when the instructors has designated that the examination is not to be removed from the examination room or not to be returned or to be kept by the student;
- substituting for another person, or permitting another person to substitute for oneself to take a course, a test, or any course-related assignment;
- paying or offering money or other valuable thing to, or coercing another person to obtain an unadministered test, test key, homework solution, or computer program or information about an unadministered test, test key, home solution or computer program;
- falsifying research data, laboratory reports, and/or other academic work offered for credit;
- taking, keeping, misplacing, or damaging the property of The University of Texas at Tyler, or of another, if the student knows or reasonably should know that an unfair academic advantage would be gained by such conduct; and
- misrepresenting facts, including providing false grades or resumes, for the purpose of obtaining an academic or financial benefit or injuring another student academically or financially.

ii. “Plagiarism” includes, but is not limited to, the appropriation, buying, receiving as a gift, or obtaining by any means another’s work and the submission of it as one’s own academic work offered for credit.

iii. “Collusion” includes, but is not limited to, the unauthorized collaboration with another person in preparing academic assignments offered for credit or collaboration with another person to commit a violation of any section of the rules on scholastic dishonesty.

iv. All written work that is submitted will be subject to review by plagiarism software.

21. UT Tyler Resources for Students

- UT Tyler Writing Center (903.565.5995), writingcenter@uttyler.edu
- UT Tyler Tutoring Center, tutoring@uttyler.edu
- The Mathematics Learning Center, RBN 4021, this is the open access computer lab for math students, with tutors on duty to assist students who are enrolled in early-career courses.
- UT Tyler Counseling Center (903.565.5746); 24/7 Crisis Line at 903.566.7254
- College of Engineering Career Success: Professional Preparedness: This Canvas resource page provides career readiness resources, guides, templates, and information about upcoming events and career fairs. This is not a graded course and does not include course assignments. Students may self-enroll at: <https://uttyler.instructure.com/enroll/9JGA3L>

Schedule:

week		August	Material	Assigned Reading	Evaluation due
1	Mo	24	Syllabus, Introduction, Soft skills (Conflict Resolution)	TWS - 0	-
	Tu	25	Project Intro and Definition of Tasks	-	-
	We	26	Soft skills (Conflict Resolution)	-	-
2	Mo	31	Soft skills - Leadership, Teamwork, Communication	-	
		September	Material	Assigned Reading	Evaluation due
2	Tu	1	10 % Project Report Requirements / Concept Selection	-	-
	We	2	Promax training - day 1	-	-
3	Mo	7	No class - Labor day	-	-
	Tu	8	Concept Selection / Strategy Table		-
	We	9	Promax training - day 2	-	Sustainability survey: pre-project
4	Mo	14	Diagrams	TWS - 1	-
	Tu	15	TECOP analysis	-	-
	We	16	PFDs	TWS - 2	Writing assignment 1: Concept selection / Strategy Table
5	Mo	21	PFDs	TWS - 2	-
	Tu	22	Promax model review	-	-
	We	23	Process Conditions	TWS - 6	Writing Assignment 2: TECOP Analysis
6	Mo	28	Process Conditions	TWS - 6	-
	Tu	29	Preliminary Individual Presentations	-	Preliminary Individual Presentations
	We	30	Product tracing	TWS - 4,5	Writing Assignment 3: Process Description (conditions) / PFD

		October	Material	Assigned Reading	Evaluation due
7	Mo	5	no class	-	
	Tu	6	Process Equipment	-	
	We	7	Fluid Machinery: Pump Classification, Centrifugal Pumps, Pump performance	WRF - 14	
8	Mo	12	Scaling Laws for Pumps and Fans	WRF - 14	
	Tu	13	PHAs		
	We	14	Net Positive Suction Head	WRF - 14	10 % written report
9	Mo	19	Matching system to pump characteristics	WRF - 14	
	Tu	20	Promax model review - inlet, amine, glycol		
	We	21	10 % report feedback, Heat Transfer - fundamental concepts	BLID - 2	10 % peer evaluation
10	Mo	26	Heat Transfer - fundamental concepts	BLID - 3	
	Tu	27	Promax model review - cryo, residue compression, liquids		
	We	28	Heat Exchanger Types, Overall Heat Transfer Coefficient , LMTD	BLID - 11	Writing assignment 4: Pumps/fans/compressors sizing
		November	Material	Assigned Reading	Evaluation due
11	Mo	2	Heat Exchanger Types, Overall Heat Transfer Coefficient , LMTD	BLID - 11	
	Tu	3	Promax model review - balance of plant	-	
	We	4	Heat Exchangers	BLID - 11	Writing assignment 5: Promax simulations
12	Mo	9	Heat Exchangers	BLID - 11	-
	Tu	10	25 % presentation dry run		25 % presentation dry run
	We	11	Mass Transfer Considerations for Separations - Introduction, Diffusion	WRF - 24, 25	Writing Assignment 6: Design of Heat Exchangers
13	Mo	16	Mass Transfer Considerations for Separations - Convection	WRF - 28	-

	We	17	25 % presentation and feedback	-	25 % presentation
	Th	18	Mass Transfer Considerations for Separations - Equipment	WRF - 31	-
14	Mo	23	Thanksgiving Holiday	-	-
	Tu	24	Thanksgiving Holiday	-	-
	We	25	Thanksgiving Holiday	-	-
15	Mo	30	Mass Transfer Considerations for Separations - Equipment	WRF - 31	-
		December	Material	Assigned Reading	Evaluation due
15	Tu	1	PSV sizing and gas relief	-	-
	We	2	Mass Transfer Considerations for Separations - Equipment	WRF - 31	25 % report
16	Mo	7	-	-	Peer evaluations (25 %), Sustainability survey: post-project, gas relief spreadsheet