

SYLLABUS

CHEN 4370 Chemical Plant Design I

Faculty Information

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Course Description:

Welcome to CHEN 4370 – Chemical Plant Design I. This course will utilize engineering concepts, industry experience, and simplified methods to help students design an oil and water handling facility. Through lectures, homework assignments, and project assignments, students will apply their knowledge and think-outside the box where needed to solve engineering problems related to equipment and facilitates design.

A Case Study will be assigned to students giving them an opportunity to apply concepts and present a solution to the instructor. The Students will learn how to size and select various type of process equipment throughout the course.

This is the first part of the capstone course. Students successfully completing the course will be prepared to take their final Senior Capstone Course, CHEN 4350 Chemical Plant Design II.

Course Objectives:

1. Describe the specific types of equipment used in the design, construction, and operation of oil and water handling facilities.
2. Apply engineering principles to calculate flash calculation using MS Excel, not commercial process design software, to give approximate calculations for a multi-component system.
3. Use engineering concepts and reasoning skills to design a surface production facility to separate oil, gas, and water.
4. Develop a simple project execution plan to design and construct a process facility.
5. Evaluate facilities layout and optimize the process based on known site and environmental conditions.
6. Demonstrate technical competency by submitting oral and written reports for the Case Study.

Course Prerequisites:

This course is a senior-level course and students shall have completed the following courses:

- CHEN 3302 Chemical Engineering Thermodynamics II
- CHEN 3320 Mass Transfer
- MENG 3316 Heat Transfer
- MENG 3310 Fluid Mechanics

This course shall be taken concurrently with the following course:

- CHEN 4310 Separation Processes

Students not meeting the requirements in this section can only take this course with a signed exception from the Chemical Engineering Department Head.

Course Materials:

Stewart & Arnold. (2008). Surface Production Operations, Vol. 1 (3rd ed). Gulf Professional Publishing.
Analysis, Synthesis, and Design of Chemical Processes; Turton, Whiting, Shaeiwitz, 5th Edition.

Faculty Availability:

Department faculty shall post regular office hours and it is our goal to be reasonably available to students and provide guidance and assistance as needed. You are expected to interact with department faculty and are encouraged to seek additional instruction as warranted. There are several ways you can seek direction or assistance from the instructor:

- Stop by the instructor's office at any time during posted office hours as this is the time the instructor has set aside to answer your questions.
- Meet with the instructor after class and set an appointment time.
- E-mail, text, 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.

Classroom Procedures:

Bring study notes, textbooks, note-taking material, and calculator to every class. You may not borrow, use, or exchange calculators during graded events. If your calculator fails during a graded exercise, the

instructor or university is not responsible to furnish a substitute. Class preparation is your individual responsibility.

Academic Dishonesty:

Representation of other's work as your own will not be tolerated. Cheating on examinations, quizzes, 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.

Homework Assignments:

A set of homework problems will be assigned throughout the course (ten homework assignments during the semester). Homework is mandatory and contributes to your final grade. As an engineer your goal is to make a clear, logical, and professional presentation of your work, which is both accurate and correct. As such, both the presentation and the accuracy of your work is important, and both will be graded. It is critical that you show all of your work and leave "footprints" so that it can be easily followed. The instructor should not have to make assumptions to determine how the solution was achieved. For each homework problem, the corresponding topic, steps taken, and the numerical solution should be provided to obtain full credit. The work that you turn in should be your own. Homework assignments are due at the beginning of class on the date show in class schedule.

Project Assignments and Case Study:

Students enrolled in this course will be required to work on Case Study. The Case Study solution and presentation are the pinnacle of this course. The Case Study will constitute a major portion of the earned grade in this course. A Case Study Report (35 points) and Presentation (15 points) will culminate in the successful completion of this course. During the semester, there will be five Project Assignments that will progress the student towards the finalization of the Case Study. There is not one correct solution for the Project Assignments and the Case Study. At times in your career, an engineer may be expected to offer a unique, cost-effective, and technically viable solution to a problem. Thus, the Case Study is a creativity exercise in which you are encouraged to apply the concepts learned in this course and will likely draw upon skills and knowledge obtained from prior completed courses in the engineering program. Make sure your complete work and final solution (or recommendation) is clear and detailed. Your Case Study will be evaluated by your statement of the problem, the final recommendation or solutions offered, and the thought process used in arriving at your recommendation or solution.

You are expected to present your recommendation or solution for the Case Study in the form of a report, complete with problem statement, analysis, calculations, recommendation, and summary. It is suggested, but not required, that the report be completed in APA format (American Psychological Association <https://apastyle.apa.org/>) complete with references. Should the student desire to present

the report in another approved style that they are more familiar with, approval and guidelines shall be submitted to the instructor 2 weeks prior to the Report due date in this syllabus.

The final Case Study will be submitted as a report together with a presentation on, or prior to, the due date.

Projects will be graded with consideration to the following:

- The problem statement is clearly defined.
- The solution or recommendation is creative and unique.
- The report and/or presentation shall make excellent use of the concepts learned in this and other Chemical Engineering classes, as warranted.
- Data or summary provide is logical and concise.
- Presentation shall be evaluated based on content and delivery.
- Student shall be prepared to answer questions following any given presentation.
- Student shall be appropriately dressed for the presentation.

Late Submission of Homework, Projects, or Papers:

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 the instructor more than 24 hours in advance. An assignment is considered late if it is not submitted at the beginning of the scheduled class. Points will be deducted as indicated below and will be assessed for a “COORDINATED LATE” submission:

- 25% will be deducted if the assignment is submitted 0-24 hours after the assignment is due
- 50% will be deducted if the assignment is submitted 24-48 hours after the assignment is due
- If the assignment is submitted more that 48 hours after it is due, no credit will be given.

Under extenuating circumstances, the assignment may be accepted for full or partial credit if the student contacts the instructor with a legitimate excuse as soon as the extenuating circumstance is known. The instructor has the final determination whether the excuse is legitimate and whether or not the assignment is accepted for full or partial credit.

Student Conduct and Documentation of Assignments:

While this is an undergraduate course, you are expected to present your work in a professional manner. Written assignments and presentations shall be evaluated based on technical content, writing style, clarity, and professionalism. Plagiarism is never acceptable in the academia or in the real world.

All homework, project assignments, and case studies in this course must be properly documented. **YOU ARE REQUIRED TO ACKNOWLEDGE AND DOCUMENT ALL ASSISTANCE AND REFERENCES USED INCLUDING COURSE NOTES, TEXTBOOKS, AND READING ASSIGNMENTS.**

Writing style and references shall be provided using the APA Guidelines and can be found at:

<https://apastyle.apa.org>

Students will not be penalized for 100% compliance to the APA style, but all references should follow the APA-style citation guidelines. Reports may be returned to the student for not following or attempting to follow the APA style. Students may be given an opportunity to resubmit papers or reports at the discretion of the instructor.

For homework assignments, formal documentation is not required. A simple notation stating the reference or source at the point of your text or answer is considered adequate documentation for homework assignments.

Quizzes:

There will be five quizzes on scheduled dates during the semester. Quizzes will include problems from previous homework assignments (numerical values may be modified) and may include definitions or questions on simple terminology.

The lecture prior to the quiz will review items to be covered. Students are encouraged to ask questions about material prior to the quiz.

Participation Grade:

Students are expected to be engaged in class and outside of the class. The instructor will assign a participation grade to each student based on the following observations:

- Attendance in class and punctuality
- Level of participation in class
- Asking questions outside class: after class, during office hours, and by e-mail.

Attendance in class is the component with the most weight on participation. A student that attends every class, but otherwise is not active will receive a 2.5/5.0 as participation grade.

Final Exam:

This course will utilize Project Assignments and a Case Study in lieu of a Final Exam. The Case Study shall be submitted along with a presentation on the date indicated unless prior arrangements have been made with the instructor in advance.

Students not completing the Case Study will not be given credit for this course.

Grading and Awarded Points:

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.

Awarded Points:

Participation (1 at 5.0 points):	5
Quizzes (5 at 3.0 points each):	15
Homework (10 at 1.0 points each):	10
Project Assignments (5 at 4.0 points each):	20
Case Study Report (1 at 35 points):	35
Case Study Presentation (1 at 15 points):	15
Total Points Possible:	100

Course Grade:

90 – 100 points:	A
80 – 89 points:	B
70 – 79 points:	C
60 – 69 points:	D
Less than 60 points:	F

Collection of Student Work:

Throughout the semester student work will be collected (best, average, and worst) and submitted for the ABET course and outcomes notebook. Selected work will require submission of the original work. A copy of the graded work will be returned to you.

Assigned Reading:

The class schedule will include assigned reading for every lecture. Students who read the corresponding pages of the book and other suggested reading before each class will make the most of the lectures and their learning experience. The instructor will not cover all topics or concepts covered in the reading materials and it is the student's responsibility to read materials presented in this syllabus.

From time to time, the instructor may post lecture notes on the course website.

UT Tyler Honor Code:

Every member of the UT Tyler community joins together to embrace:

"Honor and integrity that will not allow me to lie, cheat, or steal, nor to accept the actions of those who do."

Student Rights and Responsibilities:

The student is accountable to know and understand the policies that affect your rights and responsibilities as a student at UT Tyler.

You may find more information by visiting the University website link:

<http://www.uttyler.edu/wellness/rightsresponsibilities.php>

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>

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, hotlines, and group support.

For more information on cessation programs please visit: <http://www.uttyler.edu/tobacco-free>

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

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.

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.

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.

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.

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.

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.

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.

1. "Cheating" includes, but is not limited to:
 - a. copying from another student's test paper;
 - b. using, during a test, materials not authorized by the person giving the test;
 - c. failure to comply with instructions given by the person administering the test;
 - d. 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;
 - e. using, buying, stealing, transporting, or soliciting in whole or part the contents of an unadministered test, test key, homework solution, or computer program;
 - f. collaborating with or seeking aid from another student during a test or other assignment without authority;
 - g. discussing the contents of an examination with another student who will take the examination;
 - h. divulging the contents of an examination, for the purpose of preserving questions for use by another, when the instructor 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;
 - i. substituting for another person, or permitting another person to substitute for oneself to take a course, a test, or any course-related assignment;
 - j. 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;
 - k. falsifying research data, laboratory reports, and/or other academic work offered for credit;
 - l. 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
 - m. 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.
2. "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.
3. "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.
4. All written work that is submitted will be subject to review by plagiarism software.

UT Tyler Resources for Students:

- UT Tyler Writing Center (903.565.5995), writingcenter@uttyler.edu
- UT Tyler Tutoring Center (903.565.5964), 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 (903.566.7254)

Course Schedule:

Week		August	Material	Assigned Reading	Evaluation due
1	M	23	Syllabus, Introduction	-	-
	W	25	Introduction to Production Facilities	AS. Pgs. 1-23	-
	F	27	Process Selection and Basic Process Control	AS. 24-37	-
2	M	30	Overview: Oil and Water Treatment, LACT	AS. 37-43	-
		September	Material	Assigned Reading	Evaluation due
2	W	1	Overview: Pumps, Compressors	AS. 44-56	Quiz 1
	F	3	Overview: Gas Dehydration, Treating, and Gas Lift	-	HW 1
3	M	6	<i>Labor Day - no class</i>		-
	W	8	Oil-Field Chemistry and Fluid Properties	AS. 61-96	
	F	10	Phase Behavior and Multi-component Flash Approximation	AS. 97-141	HW 2
4	M	13	Two-Phase Oil and Gas Separation	AS. 150-195	
	W	15	Two-Phase Separator Design	AS. 195-236	
	F	17	Two-Phase Separator Design	-	
5	M	20	Three-Phase Oil and Gas Separation	AS. 234-278	HW 3
	W	22	Three-Phase Separator Sizing	AS. 278-308	
	F	24	Three-Phase Separator Sizing	-	
6	M	27	Crude Oil Treating Equipment	AS. 351-396	HW 4
	W	29	Crude Oil Treater Sizing	AS. 396-447	Quiz 2
		October	Material	Assigned Reading	Evaluation due
6	F	1	Crude Stabilization	AS. 457-481	PA 1
7	M	4	Produced Water Treating, Skimmers	AS. 482-524	HW 5
	W	6	PW, Coalescers, O/W Separators	AS. 524-573	
	F	8	PW, Hydrocyclones, Skim Piles	AS. 573-607	
8	M	11	PWT Equipment Selection	-	HW 6
	W	13	Water Injection Systems	AS. 611-666	
	F	15	Water Injection Systems	-	
9	M	18	Pressure Vessels, Static Equipment	AS. 316-346	HW 7
	W	20	Rotating Equipment: Pumps	AS. 44, Other	PA 2
	F	22	Rotating Equipment: compressors	AS. 44-47, Other	
10	M	25	Proposal Support and Winning the Project	Other	HW 8
	W	27	Project Management Team	Other	PA 3
	F	29	Project Execution Plan and Kick-off	Other	Quiz 3

Course Schedule (continued):

		November	Material	Assigned Reading	Evaluation due
11	M	1	Supply Chain and Procurement	Other	
	W	3	Contractual Terms, Risk Mitigation, Recovery Plans	Other	HW 9
	F	5	Process Engineering Support: Projects, Sales, R&D, Operations	Other	
12	M	8	Technical & Commercial Proposals, Cost Estimating	Other	
	W	10	Equipment Layout	Other	PA 4
	F	12	Equipment Layout & Maintenance Considerations	Other	Quiz 4
13	M	15	Special Design Considerations: Modular vs. Stick Build	Other	
	W	17	Special Design Considerations: Onshore vs. Offshore	Other	
	F	19	Special Considerations: Environmental, Social, Local Content	Other	HW 10, Quiz 5
14	M	22	<i>Thanksgiving - no classes</i>	-	
	W	24	<i>Thanksgiving - no classes</i>	-	
	F	26	<i>Thanksgiving - no classes</i>	-	
15	M	29	Case Study - Help Session	-	PA 5
		December	Material	Assigned Reading	Evaluation due
15	W	1	Case Study - Help Session	-	
	F	3	Student Presentation of Case Study		Case Study Report & Presentation