

## MEMORANDUM FOR STUDENTS ENROLLED IN CHEN 3330

### SUBJECT: CHEN 3330 - Fluid Mechanics - Administrative Instructions

Lecture times: MWF: 11:15 am – 12:10 pm

Location: RBN 1034

Instructor: Zishu Cao

Office: RBN 3013

Email: [zcao@uttyler.edu](mailto:zcao@uttyler.edu)

Welcome to CHEN 3330 – Fluid Mechanics. This course will introduce the fundamentals basics of fluid motion. Focus is placed on applications of high relevance to the chemical industry, such as flow in pipes and characteristic curves of pumps. Students in this class learn the fundamentals of momentum transfer and how these fundamentals are applied to chemical processes. Upon completion of this course, students will be equipped to perform detailed analysis of power and fluid flow requirements in processes that are typical of the chemical industry. The material learned in this course will form the basis for additional transport phenomena courses, such as heat transfer and mass transfer.

**Mode of delivery:** This is an **in-person course** where we will meet during the assigned lecture times at the assigned lecture room. Subject to the availability of the instructor (such as attending academic conferences) and course progress, a few lectures might be offered as video sessions. The video course details will be shared via Canvas. Course assignments, such as homework and open-ended projects, will always be submitted online via Canvas.

**Import Covid-19 information:** It is important to take the necessary precautions to ensure a healthy and successful year. UT Tyler continues to urge you to protect yourselves against the flu, COVID and any new threats that may be developing. Be diligent about preventive measures such as washing hands, covering sneezes/coughs, social distancing and vaccinations, which have proven to be successful in slowing the spread of viruses. Students are encouraged to stay home when not feeling well. The students are suggested to get tested for the flu or COVID if any symptom. Self-isolation is important to reduce exposure ([CDC quarantine/isolation guidelines](#)). Please work with the instructor to maintain coursework and please consult [existing campus resources](#) for support.

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

- CHEN 2320 (Chemical Engineering Mechanics)
- MATH 3305 (Differential Equations)

2. You are encouraged to seek additional instruction (AI) during my office hours, before/after class, or by appointment. Take advantage of this opportunity, it's FREE and really will help! To take the advantage of AI, the following avenues are available:

- Scheduled office hours: Tu/Th 10:00 am – 12:00 pm
- Email to setup an appointment if you have a scheduling conflict during the office hours.

### 3. Classroom Procedures:

a) Please bring textbooks, calculators, and other learning devices to every class. If you have an ebook or e-copy of a book, you are welcome to bring your laptops/tablets. Please read the relevant assigned reading materials in the book. Attendance is highly encouraged, and it will help you to get high final grade. You will not be able to share calculators during exams or quizzes. If your calculator fails, I am not responsible to furnish a substitute. Class preparation is your individual responsibility.

b) Textbooks:

Welty, J.R.; Rorrer, G.; Foster, D.G.; "Fundamentals of Momentum, Heat, and Mass Transfer", John Wiley & Sons, New York, 2019, 7th Edition.

c) Recitations

Certain lectures will be used for recitation sessions. The instructor will compile a selection of problems to practice problem-solving skills based on the topics covered in the earlier lectures. This session will be helpful in solving the homework problems, preparing for the quizzes, and examinations. Please bring book (or ebook) to class for this session.

#### 4. Evaluations

a) Academic Dishonesty:

All work must be your own. Plagiarism of assignments (homework, projects, etc.) will not be tolerated. You can get help from others; however, all help from others must be documented. Please refer to the University of Texas at Tyler current Undergraduate Catalog for academic policies and Manual of Policies and Procedures for Student Affairs (MOPPS, Chapter 8) regarding academic integrity, cheating, and plagiarism

b) Homework:

Homework will help you understand the course materials better and are mandatory. Students may *discuss* their homework solutions with one another, but each student must submit their own, independent solutions (i.e. you may not just copy someone else's homework). If you receive assistance from a fellow student on a problem, you must cite that assistance within your solution. The problems assigned in a homework should not only be correct but should also be neat, organized, and complete (showing all the intermediate steps). No guess work should be required to see what you did. Solutions to the homework problems will be posted online after the due date.

A. Late submissions: Late homework will receive the following penalties:

- 0-24 hrs late – a 25% deduction of the earned grade
- 24-48- hrs late – a 50% deduction of the earned grade
- More than 48 hrs late – No credit

B. All homework in this course must be properly documented. As you are having your work reviewed it is likely that you might receive help from your classmates, just simply document it. Information from the course textbooks (equations and outlines of procedures), class notes, or me is considered immediately available to all students and need not be acknowledged or documented. **YOU ARE REQUIRED TO ACKNOWLEDGE AND DOCUMENT ALL OTHER ASSISTANCE AND REFERENCES USED.** Documentation will be accomplished in accordance with any manual for writing, footnote or endnote, for papers, but for written homework, just place the documentation right at the point you received help using Who and what assistance.

c) Quizzes:

There will be four quizzes on the scheduled dates during the semester. Quizzes will be based on previous homework assignments.

d) Extra credit:

There will be several opportunities to earn bonus points for additional work on problem sets, exams, or for completion of other optional assignments. Such opportunities (optional assignments) will be clearly identified. The optional assignment may help you increase your overall grade.

e) Midterm Exams and Final Exam:

There will be two mid-term exams and one final exam. The dates for Midterms are included in the course schedule. Official reasons for missing an exam are outlined in "Student handbook". You are required to take a make-up exam, regardless of your reason for missing the scheduled exam. Report any conflict to me as soon as possible prior to the exam. Exams and the final are closed book and notes. You may only use a NCEES approved (or FE equivalent) calculator (eg. Casio – FX 115 ES, TI 30XA etc.). Solutions to the exams will not be posted, however the exam will be solved in class after the graded exams are returned.

- f) Project: At some point in the semester, students will be required to work on an assigned project. More details and requirements will be posted through Canvas. The project will be graded based on the report (3 points) and oral presentation (2 points). You are encouraged to work in groups of two students. Only one report from each group is necessary. The contribution from each student should be clearly mentioned in project report. Each student is required to present some portion in the oral project presentation.

## 5. Grading

Submitted assignments should be correct, neat, and complete. The points in the course are assigned as follows:

<b>Course Points</b>	
Midterm Exams (2 at 15 points each)	30 (30%)
Homework (8 at 2 points each)	16 (16%)
Quizzes (4 at 5 points each)	20 (20 %)
Participation (1 at 4 points)	4 (4%)
Project (1 at 5 point)	5 (5%)
Final Examination (1 at 25 point)	25 (25 %)

  

<b>Grade Scale based on points</b>	
1.15 x class average or higher	A
Between class average and 1.15x time class	B
<i>Between 50 points and the class average</i>	C
Between 30 and 50 points	D
Less than 30 points	F

You need at least 50 points total to pass the course with a C grade. You need to be at the class average to receive a B grade.

If you are not satisfied with the score you receive in any of the graded work, you should let me know why the grade should be higher (due to miscounting or incorrect grading) in writing within one week of receiving back the graded work.

## 6. Collection of Student Work:

Throughout the semester I will collect student work (best, average, and worst) 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.

## 7. Assigned Readings:

You are required to do the assigned reading prior to class as it will help you to understand the material presented during the instruction and will give you an opportunity to ask questions on topics you found difficult.

## 8. 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.

## 9. Students Rights and Responsibilities:

To know and understand the policies that affect your rights and responsibilities as a student at UT Tyler, please follow this link: <http://www.uttyler.edu/wellness/rightsresponsibilities.php>

## 10. 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>

### **11. 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](http://www.uttyler.edu/tobacco-free).

### **12. 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.

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

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 that students need to be aware of. These include:

### **13. 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.

### **14. Disability Services:**

In accordance with federal law, a student requesting accommodation must provide documentation of his/her disability to the Disability Services counselor. If you have a disability, including a learning disability, for which you request an accommodation, please contact the Disability Services office in UC 3150, or call (903) 566-7079.

### **15. 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.

### **16. Student Absence for University-Sponsored Events and Activities:**

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.

**17. 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.

**18. 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.

**19. Additional UT Tyler Resources for Students**

- [UT Tyler Writing Center](mailto:writingcenter@uttyler.edu) (903.565.5995), [writingcenter@uttyler.edu](mailto:writingcenter@uttyler.edu)
- [UT Tyler Tutoring Center](mailto:tutoring@uttyler.edu) (903.565.5964), [tutoring@uttyler.edu](mailto: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)

**20. CHEN3330 Fluid Mechanics Course Objectives**

- Discuss the concepts of shear stress, viscosity, and differential fluid element.
- Use control volumes to carry out mass, momentum, and energy balances;
- Use the differential continuity equation and the Navier-Stokes equation to characterize fluid flow (steady-state, one-dimensional);
- Discuss viscous flow concepts: the Reynolds experiment, the Boundary layer, turbulence
- Perform calculations for fully developed flows in closed conduits
- Use friction factor information to estimate head loss
- Discuss the types of machine for fluid flow
- Perform calculations for centrifugal pumps, using characteristic curves and scaling laws

**21. ABET Outcomes**

- an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics. (1)
- an ability to communicate effectively with a range of audiences. (3)
- 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. (4)
- an ability to acquire and apply new knowledge as needed, using appropriate learning strategies. (7)

**22. Tentative Class Schedule:**

	Date	Topics	Chapter	Evaluations	HW Due
Aug	22	Syllabus, Introduction to Fluid Mechanics	-		
	24	Vector Operations	-		

	26	Differentiation with Vectors	-		-
	29	Differentiation with Vectors	-		
	31	Coordinate systems	-	HW 1	
Sept	2	Recitation 1	-		
	5	Labor Day Holiday			
	7	Introduction to Momentum Transfer	1	Quiz 1	HW 1 Due
	9	Introduction to Momentum Transfer	1		
	12	Fluid Statics	2		
	14	Description of a Fluid in Motion	3	HW 2	
	16	Recitation 2	-		
	19	Mass balance - control volume	4	Quiz 2	
	21	Momentum balance - control volume	5		HW 2 Due
	23	Momentum balance - control volume	5		
	26	Energy Balance - Control volume	6	HW 3	
	28	Energy Balance - Control volume	6		
	30	<b>Midterm 1</b>		Midterm 1	
Oct	3	Stress, Newtonian and non-Newtonian fluids	7		HW 3 Due
	5	Stress, Newtonian and non-Newtonian fluids	7		
	7	Differential Balances	8		
	10	The Continuity Equation	9		
	12	The Continuity Equation	9	HW 4	
	14	Recitation 3	-		
	17	Inviscid Flow	10		
	19	Dimensional Analysis and Similitude	11	HW 5	HW 4 Due
	21	Viscous Flow	12	Quiz 3	
	24	Viscous Flow	12		
	26	Boundary Layer	12		HW 5 Due
	28	Turbulence	12	HW 6	
31	Recitation 4				
Nov	2	<b>Midterm 2</b>		Midterm 2	
	4	Flow in Closed Conduits	13		
	7	Pressure drop and head loss in pipes	13		HW 6 Due
	9	Pressure drop and head loss in pipes	13	HW 7	
	11	Fluid Machinery: Pump Classification	14	Quiz 4	
	14	Pump Classification, Centrifugal Pumps	14		HW 7 Due
	16	Pump performance	14	HW 8	
	18	Net Positive Suction Head	14		
	21, 23, 25	Thanksgiving			
	28	Scaling Laws for Pumps and Fans	14		HW 8 Due
30	Project Presentation				
Dec	2	Review for Final			
	5-9	Final Exam Week			

*Note: This syllabus, including the grading criteria, schedule and the content, are tentative. They can be changed at anytime at the sole discretion of the instructor*