

University of Texas at Tyler - Department of Civil Engineering
CENG 3310 Fluid Mechanics and Hydraulics
Summer 2023 – Session 1 (May 29 – July 1)

Instructor: *Section 060 (Online)*
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Office Hours:
by appointment
via Zoom

Lecture:
Fully online asynchronous

Course Website:
Canvas will be used to manage the course material for the semester. There you will find homework assignments, homework solutions, handouts and other material pertaining to the class.
Please check there regularly.

Catalog Description:
Basic concepts of a fluid and the fundamentals/applications of ideal/real flow. Topics: fluid statics, conservation principles, Bernoulli, pipe flow, pump/turbines, momentum, drag, similitude, open channel flow.

Learning Objectives:

1. Determine pressures and forces on submerged bodies.
2. Analyze flow rates, velocities, energy losses, and momentum for fluid systems.
3. Apply the laws of conservation of mass, momentum, and energy to static fluids and general fluid flow in conduits or open channels.
4. Analyze fluid flow in pipeline components.

Prerequisites:
ENGR 2302: Engineering Dynamics; MATH 3305: Ordinary Differential Equations

Co-requisite:
MATH 3404: Multivariable Calculus

Required Text:
Any fluid mechanics textbook

Recommended Text (the one in which I reference in class):
Fundamentals of Fluid Mechanics, 8th Edition, by Munson, Young, Okilshi, Gerhart, Gerhart and Hochstein, Wiley Publishing, ISBN: 978-1-118-84713-8

Course Schedule (Subject to Change):

COURSE SCHEDULE - SUBJECT TO REVISION			
CENG 3310 Summer 2023 (FULLY ONLINE)			
Lesson No.	Date	Topic	Lesson Material
Week 1 (May 29 - June 2)			
	5/29	MEMORIAL DAY	
1	5/30	Course Introduction, Fluid Properties	1.1-1.4
2	5/30	Ideal Gas Law, Viscosity	1.5-1.6
3	5/31	Viscosity, compressibility, hydrostatic pressure	1.6-1.7.1, 2.1-2.3
4	5/31	Hydrostatic Pressure derivation and Examples	2.3.1
5	6/1	Barometers, Manometers (Piezometers and U-Tube Manometers)	2.4-2.6
6	6/1	U-Tube Manometer Example, Hydrostatic forces on plane surfaces	2.6, 2.8
	6/2	CENSUS DATE	
7	6/2	Hydrostatic forces on plane surfaces, Pressure prisms	2.8-2.9
8	6/2	Hydrostatic forces on curved surfaces	2.10
9	6/2	Buoyancy and Stability	2.11
Week 2 (June 5 - June 9)			
10	6/5	Conservation of Mass, Continuity Equation	2.10-2.11, 5.1
11	6/5	Bernoulli Equation	5.1, 6.4.2
	6/6	EXAM 1 (6 pm - 7:30 pm CST on Zoom)	
13	6/7	Energy Equation (Examples)	3.3-3.6
14	6/7	Hydraulic Grade Lines and Energy Lines	3.7
15	6/8	Laminar Flow in Pipes	8.1-8.2
16	6/8	Turbulent Flow Pipes	8.4
17	6/9	Turbulent flow pipes (examples cont), conduit flow, minor losses	8.4.2 and 8.4.3
Week 3 (June 12 - June 16)			
18	6/12	Minor Losses, Pipe flow problems	8.4.2
19	6/12	Pipe flow problems (cont'), Iteration to solve V, Q, and D	8.4.3, 8.5.2
20	6/13	Iteration to solve V, Q and D, HGL and EGL	8.5.2
21	6/13	3 Reservoirs Problem	8.5.2
22	6/14	Calculating pump head, Pitot tubes	5.3.3, 3.5
23	6/14	Hazen-Williams Equation, Pipes in Parallel	8.5.2
24	6/15	Flow meters, Momentum (intro)	8.6, 5.2
25	6/16	Momentum	5.2
26	6/16	Momentum	5.2
Week 4 (June 19 - June 23)			
27	6/19	Dimensional Analysis: Intro and Inspection methods	7.1-7.3, 7.5
28	6/19	Dimensional Analysis: Linear Equations	7.3
29	6/19	Dimensional Analysis: Data correlation	7.7
	6/20	LAST DAY TO WITHDRAW FROM ONE OR MORE COURSES	
31	6/20	Similitude	7.8, 7.6
32	6/20	Similitude	7.8, 7.6, 9.1-9.3
	6/21	EXAM 2 (6 pm - 7:30 pm CST on Zoom)	
33	6/22	Drag	9.1-9.3
34	6/22	Drag and Lift	9.3-9.4
35	6/23	General open channel flow, surface waves	10.1-10.2
Week 5 (June 26 - July 1)			
36	6/26	Specific Energy	10.3
37	6/26	Manning Equation	10.4
	6/27	EXAM 3 (6 pm - 7:30 pm CST on Zoom)	
39	6/28	Manning Equation Examples, Hydraulic Jumps	10.4
40	6/28	Hydraulic Jumps and Weirs	10.4-10.6
	6/29	DEAD DAY	
	6/30	Final Exam (6 pm - 8 pm CST on Zoom)	

Exams:

There will be 3 midterm examinations and one final examination. The exams are **TENITATIVELY** scheduled for:

- Exam 1: June 6th
- Exam 2: June 21st
- Exam 3: June 27th
- Final Exam: June 30th

Exams dates may be moved up or pushed back depending on the progress of the lectures. Exams are closed book. You can use a calculator and instructor approved reference material. *Solutions to exams will NOT be posted on Canvas.* No make-up exams will be given except for medical or other similar hardships where advanced arrangements are made with the instructor; or in case of non-selective medical emergencies with appropriate physician's note or documentation. Other than circumstances described above, failure to take the exam at the scheduled time will constitute a grade of zero in the exam. You will need access to a printer to print the exam. You will also need to print a copy of the FE packet that you will use on all exams. **ALL EXAMS WILL BE HELD ONLINE AND PROCTORED THROUGH ZOOM. EVERYONE WILL BE REQUIRED TO LOG INTO ZOOM AND HAVE CAMERA ON THROUGHOUT THE DURATION OF THE EXAM. FAILURE TO DO SO WILL RESULT IN A GRADE OF A ZERO ON THAT EXAM.**

Homework:

Homework will be assigned on a regular basis (see homework schedule). Homework is due on the date outlined in the schedule and on canvas. **You will need to upload your homework as a single pdf file to canvas no later than 5 pm on the date it is due.** No late homework will be accepted except for unusual circumstances. Homework will not be graded in the traditional sense. You will find that all homework solutions are posted on Canvas so you will be able to check your own work before submitting the assignment. You will be given full credit for submitting your homework on time and following the correct homework format. Homework that is not submitted as complete and following the homework guidelines will receive a 0. No partial credit is awarded on homework, it is 100% or 0. **Homework must be submitted on engineering paper.** Solutions should be presented in a clear methodical manner. Follow the "homework submission guidelines" when completing your assignment. Solutions which are not clearly presented will **NOT** receive credit.

Homework Submission Guidelines (Professionalism Requirements):

1. Homework should be submitted using letter size (8 ½ x 11") paper. Engineering paper is required.
2. The header of the first page should include the following:
 - a. Name of Student
 - b. Student Number
 - c. Course Number and Name
 - d. Homework Number
3. There should be no more than 2 problems per page. This is to ensure that there is enough space on the paper for the grader to add comments.
4. Multiple sheets should be stapled at the top left corner of the page.
5. The submitted papers should be free of frail edges, stains, smudges and wrinkles.
6. All problems should include:
 - a. Problem Number
 - b. A diagram of the problem (draw all free body diagrams when necessary)
 - c. A set of given quantities
 - d. A set of unknown quantities
 - e. A set of assumptions
7. All numbers and writing should be clear and readable.

8. When required to produce a graph, use a computer program such as excel or matlab to generate the plot. Do not draw it by hand!
9. The **final answer should be boxed** and at the end of the solution.

Grades:

Homework = 15%
Professional Practice =15%
Midterm Exams (3) = 45%
Final Exam = 25%

Grade Scale:

A: 90-100
B: 80-89
C: 70-79
D: 60-69
F: <60

If necessary, I reserve the right to adjust the grade scale at the end of the semester to your benefit.

If you earn less than 65% on all Exams or if you fail to earn at least 50% on the Final you may fail the course, **regardless of your course grade.**

****NOTE:**

There will be no makeup work or extra credit allowed/granted at the end of or during the semester unless allowed/granted to everyone by the instructor. All assignments must be turned in at the appropriate time to receive credit.

Professional Practice:

Your professional practice grade will be 15% of your overall grade in this course. Professional practice this summer will entail watching 3 videos that have been posted to canvas and providing a short writeup for each video using the template provided on canvas. While the discussion points in these videos are not technical in nature, the content covered will help provide you some insight into non-technical areas that are just as important. At UT Tyler, our goal is to not only make sure you have the strong technical skills to be successful in your career but also many of the non-technical, but just as important, skills. This professional practice grade is to give you some of the non-technical skills that will hopefully make you successful.

Laptops/PDAs/MP3 players/Cell Phones or other electronic devices:

- The use of any electronic device, except an approved calculator, is not permitted during exams. Your exam will be collected and your grade will be a zero if you are caught using a non-approved electronic device/calculators. Any instances of a calculator inappropriately used during an exam will be the basis of alleging Academic Misconduct and may result in Failing (F) of the course at the determination of the course's instructor or the basis for a recommendation for expulsion from the University. Any Calculator used during an exam in this course must meet the requirements stated within the policy below.

Calculator Policy:

Only NCEES approved calculators will be permitted during tests and your test will be collected and your grade will be a zero if you are using a non-approved calculator.

The approved calculators include the following: (Please check the NCEES website for a complete listing, www.ncees.org/exams/calculator-policy/. Examples include but are not limited to:

- Hewlett Packard – HP 33s, HP 35s, and no others
- Casio – All FX 115 models
- Texas Instruments – All TI 30X or TI-36X models.
- If you are unsure about your calculator, it is your responsibility to check with the instructor for approval.

At the discretion of the course instructor, any calculator not meeting the requirements stated (especially in the case of a graphing calculator) may be used but only after an inspection of the device and a clearing of all the memory within the device, performed for the instructor at a time immediately prior to the exam. At any time during the exam your calculator is subject to a random search by the instructor. Failure or refusal to clear all memory or to surrender your calculator to search will disqualify you from the exam immediately, unless you can produce a calculator meeting the requirements as stated above.

Final day to withdraw:

The final day to withdraw from the course without penalty is **June 21st**

Census dates:

The university requires that instructors to report the attendance to the register at various points in the semester. Therefore, on **June 5th** I will report the attendance for the class.

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.

Academic Misconduct: Plagiarism of homework and cheating on examinations will be interpreted as academic misconduct and will not be tolerated. 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. Academic dishonesty will not be tolerated. Ignorance of the rules and policies provides no protection from the consequences.

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/StudentRightsandResponsibilities.php>

Grade Replacement/Forgiveness and Census Date Polices: 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 that students need to be aware of. 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 Tyler at Texas offers accommodations to students with learning, physical and/or psychological disabilities. If you have a disability, including non-visible a 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 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: 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.

- 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 SafeAssign™, available on Blackboard. 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)

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.

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>

Prepared by: Michael V. Gangone, Ph.D.
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Department of Civil Engineering

Assignment Schedule:

HOMEWORK SCHEDULE - SUBJECT TO REVISION			
CENG 3310 Summer 2023			
Homework No.	Topic	Homework Assigned	Assignment Due
1	Dimensions and Fluid Properties	May 30, 2023	NOT COLLECTED
2	Ideal Gas Law, Viscosity and Compressibility	May 30, 2023	NOT COLLECTED
3	Hydrostatic Fluid Pressure	May 31, 2023	June 5, 2023
4	Gage vs. Absolute Pressure and U-Tube Manometers	June 1, 2023	June 5, 2023
5	Hydrostatic Force on Planar Surfaces	June 2, 2023	June 5, 2023
6	Hydrostatic Forces on Curved Surfaces	June 2, 2023	June 5, 2023
7	Buoyancy	June 2, 2023	NOT COLLECTED
8	Continuity Equation - Mass and Volumetric Flow Rates	June 5, 2023	June 12, 2023
9	Pipe Flow - Bernoulli Equation	June 7, 2023	NOT COLLECTED
10	Pipe Flow - HGL and EGL (no head loss)	June 7, 2023	NOT COLLECTED
11	Pipe Flow - Major Head Loss	June 8, 2023	June 12, 2023
12	Pipe Flow - Minor Losses	June 9, 2023	June 12, 2023
13	Pipe Flow - Iteration	June 12, 2023	NOT COLLECTED
14	Pipe Flow - HGL and EGL (with head loss)	June 13, 2023	NOT COLLECTED
15	Pipe Flow - Three Reservoir Problem	June 13, 2023	NOT COLLECTED
16	Pipe Flow with Pumps	June 14, 2023	June 19, 2023
17	Hazen Williams Equation	June 14, 2023	June 19, 2023
18	Conservation of Momentum	June 16, 2023	June 19, 2023
19	Dimensional Analysis	June 19, 2023	June 19, 2023
20	Dimensional Analysis Model Flitting	June 19, 2023	NOT COLLECTED
21	Similitude	June 20, 2023	June 26, 2023
22	Drag and Lift	June 22, 2023	June 26, 2023
23	Open Channel Flow - Wave Speed	June 23, 2023	NOT COLLECTED
24	Open Channel Flow - Specific Energy	June 26, 2023	June 28, 2023
25	Open Channel Flow - Manning Equation	June 26, 2023	June 29, 2023
26	Open Channel Flow - Hydraulic Jumps and Weirs	June 28, 2023	NOT COLLECTED
Exam	Content	Date	
Exam 1	Lessons 1-9, Homework 1-7	6/6/2023	
Exam 2	Lessons 10-26, Homework 8-18	6/21/2023	
Exam 3	Lessons 27-35, Homework 19-23	6/27/2023	
Final Exam	Comprehensive	6/30/2023	