University of Texas at Tyler
Department of Civil and Construction Engineering and Management
Course Syllabus
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1. **Course number and name**
   CENG 3310-Fluid Mechanics and Hydraulics

2. **Credits, contact hours**
   a. 3.0 Credit Hours (ES=2.5, ED=0.5)
   b. LESSONS: 41 @ 55 min (3 Att/wk) LABS: None
   c. This is an engineering topics course that focuses on introducing fluid mechanics and how fluids behave in various conditions.

3. **Instructor's or course coordinator's names**
   Dr. Zain Al Houri and Dr. Mrittika Rodela

4. **Textbook, title, author, and year**
   Munson, Bruce R., Donald F. Young, Theodore H. Okiishi, Philip M. Gerhart, Andrew L. Gerhart, and John I. Hochstein. 2021. Fundamentals of Fluid Mechanics. 9th ed. Wiley Publishing, ISBN: 9781119598114.

5. **Specific course information**
   a) Catalogue Description: Basic concepts of fluid, and the fundamentals and applications of ideal and real fluid flow. Topics include fluid statics, conservation principles, the Bernoulli equation, fluid flow in pipes, linear momentum, drag, similitude, fluid flow measurement devices, and open channel flow.

   b) Requisite and Co-requisite: ENGR 2302: Dynamics, MATH 3305: Differential Equations, MATH 3404: Multivariate Calculus (co-requisite)

   c) Required course

6. **Specific goals for the course**
   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.

7. **Topics covered**
   - Fluid Properties
   - Hydrostatic pressure and hydrostatic forces on planar and curved surfaces
   - Conservation of mass, energy and momentum
   - Similitude
   - Drag
   - Open channel flow (e.g. subcritical vs. supercritical flow, specific energy, Manning equation)

8. Student Learning Outcomes

	At the completion of the program, students should be able to
SO 1	Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
SO 2	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
SO 3	Communicate effectively with a range of audiences
SO 4	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
SO 5	Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
SO 6	Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
SO 7	Acquire and apply new knowledge as needed, using appropriate learning strategies

9. Mapping Course to Student Learning Outcomes

The learning outcomes of this course contribute to meeting one or more of the student learning outcomes as shown below, with the contribution designated as "H-high", "M-medium", or "L-low":

	SO1	SO2	SO3	SO4	SO5	SO6	SO7
CLO 1	H	M	L	L	-	M	M
CLO 2	H	H	L	L	-	M	M
CLO 3	H	H	L	L	-	M	M
CLO 4	H	H	L	L	-	M	M

TENTATIVE COURSE SCHEDULE

The following schedule may be adjusted, as needed, during the semester to better serve the educational needs of the class.

Week #	Date	Topic	Readings	Homework* (Assigned)
		COURSE SCHEDULE - SUBJECT TO REVISION		
	25-Aug	Course Introduction,	Syllabus	HW1
WK 1	27-Aug	Dimensions, Dimensional Homogeneity, and Units	1.1-1.3	
	29-Aug	Fluid Properties: Mass Density, Specific Weight, and Specific Gravity	1.1-1.4	
	1-Sep	**LABOR DAY**		HW2
WK 2	3-Sep	Fluid Properties: IGL, Examples: density and specific weight	1.5	
	5-Sep	Fluid Properties: Viscosity, Examples	1.6	
	8-Sep	Fluid Properties: compressibility, surface tension, Vapor Pressure	1.7-1.9	HW3
WK 3	10-Sep	Fluid statics: Describing Pressure (gage, absolute, vacuum, and pressure)	2.1-2.3	
	12-Sep	Fluid statics: Hydrostatic Equation Derivation		
	15-Sep	Fluid statics: Pressure Measurement	2.7	HW4
WK 4	17-Sep	Fluid statics: Manometry, Examples	2.6	
	19-Sep	Hydrostatic Pressure Distribution	2.8	
	22-Sep	Hydrostatic forces on plane surfaces	2.8	HW5
WK 5	24-Sep	**EXAM 1**		
	26-Sep	Hydrostatic forces on plane surfaces, Pressure prisms	2.9	
	29-Sep	Hydrostatic forces on curved surfaces	2.10	HW6
WK 6	1-Oct	Buoyancy and Stability	2.11	
	3-Oct	Elementary Fluid Dynamics-Flow Classification	3.1	
	6-Oct	Elementary Fluid Dynamics-Bernoulli Equation, Example	3.4	HW7
WK 7	8-Oct	Elementary Fluid Dynamics- Describe Pressure Variations in a Moving Fluid	3.2	
	10-Oct	Elementary Fluid Dynamics-Continuity Equation	5.1	
	13-Oct	Elementary Fluid Dynamics-Continuity Equation Application	5.1	HW8
WK 8	15-Oct	Velocity Measurement	3.5	
	17-Oct	Energy Grade Line (EGL), and Hydraulic Grade Line (HGL).	3.7	
	20-Oct	Energy Equation, Examples	5.3	HW9
WK 9	22-Oct	Pump and Turbine-Power and Efficiency; Energy Equation: EGL and HGL	3.7	
	24-Oct	Calculating pump head	5.3.3	
	27-Oct	Viscous flow in Pipes: Head Loss-Darcy's Weisbach	8.4	HW10
WK 10	29-Oct	**EXAM II**		
	31-Oct	Head Loss-Darcy's Weisbach-Type I	8.5.1	
	3-Nov	Pipe flow problems (con't), Iteration to solve for V, and Q	8.5.1	HW11
WK 11	5-Nov	Pipe flow problems (con't), Iteration to solve for D-Design Case	8.5.1	
	7-Nov	Hazen-Williams Equation, Pipes in Parallel,	8.5.2	
	10-Nov	Minor Losses, Pipe flow problems	8.4.2	HW12
WK 12	12-Nov	Derivation of the Linear Momentum Equation	5.2.1	
	14-Nov	Linear Momentum Equation: Application	5.2.2	
	17-Nov	General Characteristics of open channel flow	10.1	HW13
WK 13	19-Nov	Manning's Equation	10.4.2	
	21-Nov	Specific Energy, Hydraulic Jumps	10.3.2	
WK 14	24-Nov 26-Nov 28-Nov	**THANKSGIVING BREAK (11/24 - 11/28)**		
	1-Dec	Dimensional Analysis: Data Collection, Linear Equations	7.1-7.3	Prof. Practice
WK 15	3-Dec	Drag and lift	9.3-9.4	
	5-Dec	Final Exam Review	-	
WK 16	**08-Dec**	**Final Exam (12/08- 12/12)**		

CENG 3310-031 Fluid Mechanics and Hydraulic
Course Policies & Student Responsibilities
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Lecture Time & Venue

Meeting Time(s): Our course is scheduled from 08:00 AM-08:55 AM on M/W/F

Course Number and Section: CENG 3310, Section 031 (HEC Campus)

Classroom Number(s): Room HEC 0A217

Students are expected to attend class and take their own notes during lectures. If a class is missed, students are still responsible for all material covered. Presentation slides will be posted in the appropriate section of the CANVAS modules, but they are intended to support—not replace—your personal notes.

Instructor Information

Instructor Name: Dr. Zain Al-Houri
Office Number: HEC A211
Email: zalhouri@uttyler.edu
Office Hours (In Person):
  M/W 10:00 AM – 11:00 AM,
  T/Th 11:15 AM – 12:15 PM or
  by appointment (BEST PRACTICE is to email me ahead of time to set up an appointment for when you would like to meet.

Contact

The best method of contact is either **to send me email through Canvas** or from your Patriots account. Any email you send should have your first and last name, your course and section number (e.g., Houri CENG 3310), and proper punctuation. Failure to do so may delay the response

Course Website

Canvas will be used to manage the course material for the semester. All course materials and announcements will be provided in Canvas. There you will find homework assignments, homework solutions, handouts and other material pertaining to the class. **Please check there regularly.**

***Sharing of course materials*:** Course material delivered via Canvas may NOT be shared online or with anyone outside of the class, without me granting express written permission. The term handouts refer to all materials generated for this class, which include but are not limited to syllabi, quizzes, exams, assignment sheets, recorded lectures, outlines, in-class materials, and review sheets. The unauthorized sharing of class materials outside of the class constitutes academic dishonesty and disciplinary action may be taken (see Policy on Academic Dishonesty below).

Grading Breakdown
The following components contribute to your final grade[*]:

Assessment Component	Weight
Homework	10 %
Professional Practice	5 %
Quizzes	5 %
In Class Activities/Canvas Discussions	5 %
Midterm Exams (2)	50 %
Final Exam	25 %

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

[*]***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.***

Graded Course Requirements Information

Homework Assignments

- Homework will be assigned on a regular basis (see homework schedule).
- You will need to upload your homework as a single pdf file to canvas no later than 11:59 pm on the due date. No late homework will be accepted except for unusual circumstances.
- Homework must be submitted on engineering paper. Homework solutions not submitted on engineering paper will receive only 90% of the graded credit.
- 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 receive a 0 credit.
- 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 particular problem, you must cite that assistance within your solution.

Homework Submission Guidelines

- Homework should be submitted using letter size (8 ½ x 11") paper. Engineering paper is required.
- The header of the first page should include the following:
    - Name of Student: LAST NAME, FIRST NAME (All Caps)
    - Course Number and Name
    - Homework Number
- 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.
- All problems should include:
    - Problem Number
    - A diagram of the problem
    - A set of given quantities
    - A set of unknown quantities
    - A set of assumptions
- All numbers and writing should be clear and readable.
- 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!

AI Use and Citation Policy for Homework

If you use an AI-based writing program (such as ChatGPT) to assist with a homework assignment, you must clearly indicate this in your submission. Your citation should include the tool used (e.g., ChatGPT by OpenAI), the date accessed, and a brief description of how the tool was used (e.g., for checking the answer or solving the problem). Failure to provide proper acknowledgment of AI assistance will be treated as academic dishonesty

Example Citation:

The solution to this problem is generated with the assistance of ChatGPT (OpenAI), accessed on [date], to help brainstorm solution steps. The final work was reviewed, revised, and completed by the student.

Late Homework/ Assignment Policy

- It is a basic principle of professionalism that "Professionals are not late."
- A "COORDINATED LATE" submission occurs when you miss the suspense for a graded homework 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:
    - 0-24 hours late a deduction of 25% of the earned grade
    - 24-48 hours late a deduction of 50% of the earned grade

       ○   More than 48 hours late No credit.

Quizzes

The instructor may give unannounced or announced in-class quizzes throughout the semester. These quizzes will cover material covered in previous lectures.

Discussions

Every week, you'll be required to post a question or comment on the discussion board related to the topics we've covered. These discussions are designed to help you exchange ideas, stay engaged, provide feedback to your instructor, and hopefully make the course more interesting and enjoyable for everyone.

In-Class Activities

Active participation in class is an essential component of this course. In-class activities and exercises are designed to reinforce key concepts, develop problem-solving skills, and encourage collaboration among peers. These activities may include, but are not limited to:

- Solving example problems related to lecture topics.
- Engaging in group discussions or case studies.
- Completing short individual or team-based assignments.
- Participating in real-time quizzes or polls to assess understanding.

Regular participation will help build skills essential for success in this course.

Professional Practice Assignment

- Your professional practice grade will be based on your attendance at 3 ASCE student technical meetings (cookout and game night events do not count) throughout the fall semester. Example of valid meetings include guest speakers, field trips, or any other technical meeting from either organization within the college of engineering.

- For each professional practice meeting you must take a picture as proof of attendance, ensuring you are visible in the picture. Be sure to include the speaker's name and a summary of what you learned during the meeting.

- You should use template Word file when you attend professional practice meetings and must complete this for each meeting you attend.

- The due date to submit this is on the last day of class, which is Dec 01.

Midterm Exams and Final Exam

- There will be 2 midterm exams and one final examination. The exams are TENITATIVELY scheduled for:
    - Exam 1: W, Sep 24th
    - Exam 2: W, Oct 29th
    - Final Exam: As published by the University.

- Exams dates may be moved up or pushed back depending on the progress of the lectures.
- Exams Format: The midterm exams are worth 50 points, and the final exam is worth 25 points. The purpose of these examinations is to assess your command of the material we've covered in a particular unit. Each exam will contain conceptual questions (MC, T/F, and short answer questions), as well as numerical questions. We'll take some time in the week before an exam to talk about study strategies, and I'll be happy to answer any review questions you may have, but bear in mind that the best way to prepare for these exams is to keep up with the readings and our in-class activities.
- The mid-term exams and final exam are closed book. You can use a TI-30 calculator (or FE equivalent see calculator policy below), and instructor approved reference material.
- Use the restroom prior to coming to class to take an exam. Suspicious restroom breaks in the middle of an exam are not acceptable.
- I do not give exam back, but you can see and review in class and in my office.

- Exam solutions will NOT be posted on Canvas. However, you are welcome to visit the office to review the solutions in person. Please note that taking photos of your exam paper with your phone is not permitted.
- All exams will be held in person during class time. The final exam will also be held in person at the time, date and location specified by the university.
- Additional information will be provided in class

Late Work and Make-Up Exams

- 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.
- Failure to take the exam at the scheduled time will constitute a grade of zero in the exam.
- Official reasons for missing an exam are outlined in the UT Student Handbook. Report any conflict to me as soon as possible prior to the Exam. You are required to take a make-up Exam, regardless of your reason for missing the scheduled Exam.

Attendance Policy/Classroom Procedures

- Attendance will be taken in every class, and your presence is essential, as much of your grade will depend on what we accomplish during class meetings. I understand that emergencies or unexpected situations may occasionally prevent you from attending. If this happens, please notify me as soon as possible so we can make arrangements to help you catch up. However, this does not apply to non-emergencies, such as oversleeping. For absences due to university-sponsored activities, please coordinate with me in advance to address any missed work.
- Bring study notes, textbook, note-taking material, and calculator TO EVERY CLASS. You may not borrow or exchange calculators during graded events. If your calculator fails during a graded exercise, I am not responsible for furnishing a substitute. Class preparation is your individual responsibility. Please refer to the Calculator Policy.
- You will need regular access to a computer with an Internet connection to be able to participate in some of the in-class activities during the period of this semester.
- I will take attendance every class. Non-attendance may adversely affect your grade. If your absence from class becomes excessive you may be asked by the instructor to withdraw from the class.
- It is a basic principle of professionalism that "Professionals are not Late." Please come to class on time and leave on time. Interruption of lecture is not acceptable. Normally an excuse would be given for being late or missing that class if you have a valid verified urgent emergency or some validated significant act of nature or God like a car accident.
- **No food or snacks in classrooms.**
- Phones ringing or vibrating are distracting during class or if you are texting during class, you will relinquish your device for the duration of the class. A second offense will result in a request for you to leave the classroom.

Tips for Success in this Course

1. **Participate.** I invite you to engage deeply, ask questions, and talk about the course content with your classmates. Participation can also help you articulate your thoughts and develop critical thinking skills.
2. **Manage your time.** I get it! Students usually juggle a lot, and I know you've got commitments beyond this class. Still, doing your best often means carving out enough dedicated time for coursework. Try scheduling specific blocks of time and ensure you have enough room to finish assignments, allowing extra space for any tech issues that might pop up.
3. **Login regularly.** I recommend that you log in to Canvas several times a week to view announcements, discussion posts and replies to your posts.
4. **Do not fall behind.** This class moves at a quick pace, and each week builds on the previous class content. If you feel you are starting to fall behind, check in with me as soon as possible so we can

troubleshoot together. It will be hard to keep up with the course content if you fall behind in the pre-work or post-work.

5. **Use Canvas notification settings.** Pro tip! Canvas can ensure you receive timely notifications in your email or via text. Be sure to enable notifications to be sent instantly or daily. (Canvas Notification Guide)

6. **Ask for help if needed.** If you are struggling with a course concept, reach out to me and your classmates for support.

Calculator Policy

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

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.

Communication & Support

- Students are expected to display proper netiquette (Internet etiquette) with their instructor and with other students. This includes being polite, stating your needs clearly and politely. Practice collegiality and mutual respect. If an email or discussion post ever concerns you, please notify me privately and we'll work toward a resolution.

- In general, the most efficient way to communicate and to get the help you need with your questions and/or concerns is during office hours. If you meet during my office hours, you can send me an email to schedule a time that suits you. Be professional in writing emails! Follow the following guidelines in preparing in all your correspondence:

• Include a subject Line • Add "[Course Prefix and #]" • Use a greeting • Sign the end of your email with your name and a thank you • State your needs clearly and politely!	• Demand help • Be ambiguous with your need • Use slang or inappropriate language • Email past 7 pm and expect an answer before school in the next day • Send an email and never check for a response!

All email correspondence should take place through the Canvas system and therefore using your Patriot email accounts; check your Patriot email account often. I will try to respond to all emails within 24 hours.

Final Day to Withdraw

The final day to withdraw from the course without penalty is **Sep 17th.**

The last day to withdraw from the course is **Nov 03.**

Census Dates

The university requires that instructors report the attendance to the register at various points inthe semester.

Therefore, on **September 8th**, 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 thosewho do.

Chat GPT or other AI sources

Students may use AI-based writing programs only for homework assignments, and any AI-generated content must be properly cited or referenced. The use of AI tools on exams or quizzes is strictly prohibited. Unauthorized use will be considered cheating according to the Academic Dishonesty policy below.

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.

Technical Support

For technical problems with Canvas, contact UT Tyler 24/7 Canvas Support, which can be accessed by clicking Help at the bottom of the Global Navigation menu on the far-left side of the browser window. For login/password problems or support for other technical issues, contact Campus Computing Services at 903-565-5555 or itsupport@uttyler.edu.

University Policies & Student Resources

University policies and student resources are available on the University website and in Course home page on Canvas:

- University Policy
- Student Resources