

Syllabus:

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Course:

CE 3105 Mechanics of Fluids Laboratory

Course Catalog Description:

(1) Mechanics of Fluids Laboratory. Prerequisite: CE 3305. Experimental studies of fluid behavior.

Prerequisites:

CE 3305 or equivalent

Course Sections

Lesson time, days, and location:

1. Section 301; CRN 29480; 1530-1800 M ; CE 007/191B ; Lab TA TBD
2. Section 303; CRN 40309; 1530-1800 T ; CE 007/191B ; Lab TA TBD
3. Section 304; CRN 54141; 1530-1800 W ; CE 007/191B ; Lab TA TBD
4. Section 302; CRN 69988; 1530-1800 TH ; CE 007/191B ; Lab TA TBD

Course Instructor:

Instructor: Theodore G. Cleveland, Ph.D., P.E., M. ASCE, F. EWRI

Email: theodore.cleveland@ttu.edu (put CE 3105 in subject line for email related to this class)

Office location: CECE 203F

Office hours: TBD

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Teaching Assistant(s):

1. TBD email: TBD@ttu.edu (put CE 3105 in subject line for email related to this class)
2. TBD email: TBD@ttu.edu (put CE 3105 in subject line for email related to this class)

Textbook(s):

[Instructor Notes](#) are available and will serve as the textbook.

[Supplimental Readings](#) if any, are stored on the class server.

Course Objectives:

This course aims to enhance students' understanding of the behavior of real fluids and their interactions with physical systems through hands-on experimentation and theoretical analysis. By engaging in the experimental method, students will develop critical thinking and problem-solving skills. The course also emphasizes improving technical writing proficiency and preparing students for the fluid mechanics section of the FE Exam. Collaborative group work is a cornerstone of this course, with peer assessment contributing to a portion of the final grade.

Knowledge, Skills, Abilities (KSA) :

By the end of this course, students will be able to:

1. Analyze and solve fluid mechanics problems using measured and tabulated fluid properties with appropriate units.
2. Solve manometer problems by applying the fundamental equations of fluid statics.
3. Calculate pressures, forces, and lines of action for fluids at rest on plane and curved surfaces.
4. Define and evaluate control volumes in fluid flow systems.
5. Apply the principles of conservation of mass, energy, and momentum to control volumes.
6. Predict the effects of channel transitions, such as changes in width or bed level, in open channel flow problems.

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7. Compare and contrast the behavior of real and theoretical fluids based on experimental observations.
8. Develop step-by-step protocols for conducting fluid mechanics experiments and collecting reliable data.
9. Measure values such as head, discharge, and fluid properties using legacy techniques to support calculations involving conservation laws.
10. Measure values such as pressure and discharge using modern automated methods, including DIY data loggers and digital and analog sensors, to support conservation law applications.
11. Write effective, concise reports that clearly document experimental methods, data analysis, and conclusions, emphasizing technical accuracy and professional presentation.

ABET Student Outcomes

This course specifically addresses the outcomes listed below. Only the primary outcome is assessed as part of the CECE Continuous Improvement Program.

Primary Outcomes

1. (6.) an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions

Secondary Outcomes

1. (1.) An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. (7.) An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

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About ABET EAC Criteria

The outcomes above (primary and secondary) are a subset of those prescribed in ABET EAC General Criteria for Bacculaterate Programs

Criteria 3, Student Outcomes The program must have documented student outcomes that support the program educational objectives. Attainment of these outcomes prepares graduates to enter the professional practice of engineering. Student outcomes are outcomes (1) through (7), plus any additional outcomes that may be articulated by the program.

The primary outcomes (above) are assessed as part of the CECE Continuous Improvement Program that is prescribed in ABET EAC General Criteria for Bacculaterate Programs

Criteria 4, Continuous Improvement: The program must regularly use appropriate, documented processes for assessing and evaluating the extent to which the student outcomes are being attained. The results of these evaluations must be systematically utilized as input for the program's continuous improvement actions. Other available information may also be used to assist in the continuous improvement of the program.

ABET (2024) Criteria for Accrediting ENGINEERING PROGRAMS. 415 North Charles St., Baltimore, MD 21201 @ https://www.abet.org/wp-content/uploads/2023/03/23-24-EAC-Criteria_FINAL2.pdf.

Resources/Tools

Computational ability equivalent to those presented in ENGR 1330 are expected.

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The college of engineering has specific laptop requirements for courses that are listed at

<https://www.depts.ttu.edu/coe/dean/engineeringitservices/buyingtherightcomputer.php>

A minimal AWS Lightsail Instance (use Windows Server 2000 template; lowest resource provision tier; AWS RDP client, or download and install own RDP client) is sufficient to run the course software if you are incapable of installation onto your own laptop.

Learning Management System

Blackboard(BB) is used as the learning management system (LMS) for this class and all exercises are to be uploaded to BB. **Late submissions are accepted, but scores are automatically reduced by 50%.**

Laboratory Notes

The laboratory notes are located at http://54.243.252.9/ce-3105-webroot/ce3105notes/_build/html/intro.html

```
%%html
<style> table {margin-left: 0 !important;} </style>
```

Course Schedule

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date	topic	readings	homework
13-17 Jan 2025	Week 1 (Partial Week) - Syllabus/Introduction - Laboratory Safety - Team Assignments - Lab Reports	- Laboratory Safety - Lab Reports	
20-24 Jan 2025	Week 2 (Partial Week) - Syllabus/Introduction - Laboratory Safety - Team Assignments - Lab Reports	- Laboratory Safety - Lab Reports	
27-31 Jan 2025	Week 3 - Introduction - Laboratory Safety - Team Assignments - Lab Reports	- Laboratory Safety - Lab Reports	- Submit Laboratory 1 Procedure - Submit Safety Certificates on BB
03-07 Feb 2025	Week 4 - Fluid Properties - Density - Viscosity	- Laboratory 1	- Submit Laboratory 2 Procedure - Submit Safety Certificates on BB
10-14 Feb 2025	Week 5 - No Labs (Job Fair)		
17-21 Feb 2025	Week 6 - Displacement - Archimedes Principle - Bouyancy	- Laboratory 2	- Submit Laboratory 3 Procedure - Submit Laboratory 1 Report
24-28 Feb 2025	Week 7 - Flow Measurement - Time-to-Fill - Venturi - Rotameter	- Laboratory 3	- Submit Laboratory 4 Procedure - Submit Laboratory 2 Report
03-07 Mar	Week 8 - Friction Loss in a	- Laboratory	- Submit Laboratory 5

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date	topic	readings	homework
2025	Pipe - Modified Bernoulli - DW Head Loss Model	4	Procedure - Submit Laboratory 3 Report
10-14 Mar 2025	Week 9 - Fitting Losses in a Pipe Network - Expansions/Contractions - Bends - Loss Model Structure	- Laboratory 5	- Submit Laboratory 6 Procedure - Submit Laboratory 4 Report
17-21 Mar 2025	Week 10 - No Labs (Spring Break)		
24-28 Mar 2025	Week 11 - Momentum Transfer - Jet Impact on a Plate - Team Assignments	- Laboratory 6	- Submit Laboratory 7 Procedure - Submit Laboratory 5 Report
31 Mar - 04 Apr 2025	Week 12 - Pump Performance - Single Pump - Pumps in Series - Pumps in Parallel	- Laboratory 7	- Submit Laboratory 8 Procedure - Submit Laboratory 6 Report
07 - 11 Apr	Week 13- Friction Losses in an Open Channel - Manning's Equation - Weirs - Momentum Conservation in a Hydraulic Jump	- Laboratory 8	- Submit Laboratory 9 Procedure - Submit Laboratory 7 Report
14 - 18 Apr	Week 14- Water Hammer in Pipeline - Rigid Column Theor - Rigid Column Theory - Elastic Column Theory	- Laboratory 9	- Submit Laboratory 8 Report

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date	topic	readings	homework
	- Numerical Modeling		
21 - 25 Apr	Week 15 - No Labs (April 21 No Classes)		
28 Apr - 02 May	Week 16 - Lab Exam		- Submit Laboratory 9 Report
05 May 2025	Week 17 - No Labs (Complete any outstanding reports)		No Submissions after 5 May 2025 will be scored

Course Assessment and Grading Criteria:

There will be 8-9 laboratory reports, 8-9 BB tests (quizzes), a comprehensive Lab exam, and 8-9 effort reports.

Late assignments will incur a substantial penalty.

Grades will be based on the following components; weighting is approximate:

Assessment Instrument	Weight(%)
Attendance	10
Laboratory Reports	40
Effort Reports	10
BB Quizzes	20
Lab Final Exam	20
Overall total	100

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Letter grades will be assigned using the following proportions:

Normalized Score Range	Letter Grade
≥ 90	A
80-89	B
70-79	C
55-69	D
< 55	F

Classroom Policy:

The following activities are not allowed in the classroom: Texting or talking on the cellphone or other electronic devices, and reading non-course related materials. Use of cellphones cameras for recording phenomena is allowed

Safety and Wellness Statement:

The Texas Tech University (TTU) and Edward E. Whitacre Jr. College of Engineering are committed to the safety and wellness of our students by providing various services and resources. Make sure you register with [Tech Alert](#) to get emergency notifications by phone call, text, or email. You are encouraged to review the [Emergency Action Plans \(EAPs\)](#) and watch the videos of [Know What To Do In Emergency Events](#) and [Surviving an Active Shooter Event Training](#) to be prepared for those emergency situations. Additionally, due to the nature of laboratory or design courses, it is mandatory for you to follow the [university safety policies](#) and any additional safety training and protocols required by the course instructor(s). For your wellbeing, various services are available at [Student Counseling Center](#) and [Student Health Services](#). The Student Wellness Center provides convenient walk-in services M-F from 8 AM to 5 PM. Furthermore, the Texas Tech Crisis HelpLine (806-742-5555) provides 24/7/365 assistance for students experiencing a crisis or distress.

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Emergency/Crisis Phone Number(s)

Entity Name	Phone Number
TTU Police (UPD) Emergency	911
TTU Police (UPD) Non-Emergency	806.742.3931
TTU Emergency Maintenance	806.742.4OPS (4677)
TTU EHS (M-F, 8 am – 5 pm)	806.742.3876
SafeRide	806.742.RIDE (7433)
TTU Crisis HelpLine	806.742.5555
Student Wellness Center (From Urgent Care to a Full-Service Pharmacy on site)	806.742.2848

Safety Training Requirement

As part of our commitment to maintaining a safe learning environment, students are required to complete safety training before participating in any lab work or practical exercises. The safety training matrix and online safety training module are available from the Texas Tech Department of Environmental Health and Safety. Additional safety training may be required by the course instructor(s).

Laboratory Safety Training

- You **MUST** complete the mandatory safety training before performing any experiment in the lab
- The Mandatory training for CE 3105 includes:
 - **Texas Tech Lab Safety**
- **You need to upload evidence of completion in the Blackboard. There is a folder for uploading your Lab Safety** 
- You can upload valid certificates if you have taken the training previously for other classes in previous semesters

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- Your certificate must however be valid till the end of this semester 05/11/2024
- Required TTU safety Training is valid for two years from when the certificate was issued
- If you are in doubt regarding the validity of your certificate, just retake the training!!

ADA Statement (OP 34.22):

Any student who, because of a disability, may require special arrangements in order to meet the course requirements should contact the instructor as soon as possible to make any necessary arrangements. Students should present appropriate verification from Student Disability Services during the instructor's office hours. Please note: instructors are not allowed to provide classroom accommodations to a student until appropriate verification from Student Disability Services has been provided. For additional information, please contact Student Disability Services in Weeks Hall or call 806-742-2405.

Any student who, because of a disability, may require special arrangements in order to meet the course requirements should contact the instructor as soon as possible to make necessary arrangements. Students must present appropriate verification from Student Disability Services during the instructor's office hours. Please note that instructors are not allowed to provide classroom accommodation to a student until appropriate verification from Student Disability Services has been provided. For additional information, please contact Student Disability Services office in 335 West Hall or call 806.742.2405.

Academic Integrity Statement (OP 34.12):

Academic integrity is taking responsibility for one's own class and/or course work, being individually accountable, and demonstrating intellectual honesty and ethical behavior. Academic integrity is a personal choice to abide by the standards of intellectual honesty and responsibility. Because education is a shared effort to achieve learning through the exchange of ideas, students, faculty, and staff have the collective responsibility to build mutual trust and respect. Ethical behavior and independent thought are essential for the highest level of academic achievement, which then must be measured. Academic achievement includes scholarship, teaching, and learning, all of which are shared

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endeavors. Grades are a device used to quantify the successful accumulation of knowledge through learning. Adhering to the standards of academic integrity ensures grades are earned honestly. Academic integrity is the foundation upon which students, faculty, and staff build their educational and professional careers. [Texas Tech University \("University"\) Quality Enhancement Plan, Academic Integrity Task Force, 2010.](#)

Religious Holy Day Statement (OP 34.19):

1. "Religious holy day" means a holy day observed by a religion whose places of worship are exempt from property taxation under Texas Tax Code §11.20.
2. A student who intends to observe a religious holy day should make that intention known in writing to the instructor prior to the absence. A student who is absent from classes for the observance of a religious holy day shall be allowed to take an examination or complete an assignment scheduled for that day within a reasonable time after the absence.
3. A student who is excused under section 2 may not be penalized for the absence; however, the instructor may respond appropriately if the student fails to complete the assignment satisfactorily

Ethical Conduct Policy:

Cheating is prohibited, and the representation of the work of another person as your own will be grounds for receiving a failing grade in the course.

- Use of [Large Language Generative Models](#) is acceptable provided the acknowledgement discussed in the link is included.
- [Suggestion for citing use of Language Generative Models](#)

Additional Recommended Statements

1. [Discrimination, Harassment, and Sexual Violence Statement](#)
2. [Civility in the Classroom Statement](#)
3. [Plagiarism Statement](#)

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4. [Student Support Statement](#)
5. [Statement About Food Insecurity](#)

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