



**Schedule:**

- Section 301, 09:00 am - 11:50 am Monday
- Section 302, 12:00 pm - 02:50 pm Wednesday
- Section 303, 12:00 pm - 02:50 pm Monday
- Section 304, 03:00 pm - 05:50 pm Friday

**Instructors:**

- Don Bundock, CECE 215B; Ph: 806-834-8850;  
Email: [Don.Bundock@ttu.edu](mailto:Don.Bundock@ttu.edu) , Section 301, 303, & 304
- Venkatesh Uddameri, Ph.D., P.E., CECE Rm 203d; Ph: 806-834-8340;  
Email: [venki.uddameri@ttu.edu](mailto:venki.uddameri@ttu.edu) , Section 302

**Teaching Assistant:**

- Ghazal Mohammadi, Email: [ghazal.mohammadi@ttu.edu](mailto:ghazal.mohammadi@ttu.edu)

**Office Hours:**

- Don Bundock:
  - Please email for an appointment
- Venki Uddameri:
  - Please email for an appointment
- Ghazal Mohammadi:
  - Monday & Wednesday 3:00 pm – 4:00 pm or by appointment

**TTU Covid Policy :**  
**Please refer to the following link:**

[https://www.depts.ttu.edu/communications/emergency/coronavirus/?utm\\_source=MarketingCloud&utm\\_medium=email&utm\\_campaign=COVID-19+Case+Rise-Vaccination+Efforts&utm\\_content=COVID-19+website.%26nbsp%3b](https://www.depts.ttu.edu/communications/emergency/coronavirus/?utm_source=MarketingCloud&utm_medium=email&utm_campaign=COVID-19+Case+Rise-Vaccination+Efforts&utm_content=COVID-19+website.%26nbsp%3b)

**Required Textbook:**

**None.** Lab handouts will be posted on Blackboard.

**Required Software:**

Students need to have Word and Excel or equivalent. Adobe PDF reader is also required to open lecture notes and **digitally fill out and sign effort sheets.**

**Optional Textbook:**

Fluid Mechanics with Engineering Applications, Franzini & Finnemore, 10th Ed., 2002.

**Prerequisite:** CE3305 Mechanics of Fluids

## Course Objectives

The students will be exposed to the experimental method and will be able to:

1. Make measurements of fluid properties and flow phenomena,
2. Apply the fundamental principles of hydrostatics and conservation of mass, energy, and momentum to a control volume,
3. Write a report on the experiment and discuss the experimental observations in the context of theory.

## Course Assessment

1. Class attendance is required.
- 2. Quizzes will be on the blackboard.**
3. Lab groups must perform their experiment during their assigned period.
4. Each group will submit one report by the designated deadline with independent data analysis and discussion. All members of the group must contribute equally to the report.
- 5. LATE REPORTS WILL NOT BE ACCEPTED.**
6. Reports must be typed. No handwritten reports will be accepted.
7. Students have 1 week after the return of reports to dispute their grade. After 7 days, scores are closed for discussion.

## Class participation

During class, students will be asked questions and are expected to participate in a meaningful manner.

**Attendance is mandatory.** You are required to attend the section you are signed up for. Students will not be allowed make up for missed labs without obtaining the approval of the instructors. Please obtain the approval from the instructors beforehand if you are going to be on an university excused absence. Please let the instructors know, as soon as possible, if you are unable to make it to your section due to health reasons. You will be required to submit a doctor's note that authenticates your inability to attend classes on the day of your lab due to your medical condition. Many labs are setup and conducted using the same stations. As such, it may not be possible to hold the experimental setup the following week. Therefore, it is important to notify the instructors of your absences as quickly as possible. If you are in the Friday section and know you will be on a university excused absence, you will have to make up your lab during one of the Monday or Wednesday sections of that week.

**A student missing a lab experiment without a valid excuse (documented illness or university excused absence) will receive a grade of zero for that lab.**

**As the class is based on experiential learning a grade for the class cannot be assigned if the student misses more than 3 labs due to any ongoing medical reasons. Please contact the instructor with valid medical documentation to explore options in this case.**

### Tentative Schedule

Date	Activity	Deadline of the reports	Deadline of the quizzes
Aug 23 <sup>rd</sup> – Aug 27 <sup>th</sup>	No LABS First Week	-	-
Aug 30 <sup>th</sup> - Sep 3 <sup>rd</sup>	Safety Certificate	-	-
Sep 6 <sup>th</sup> – Sep 10 <sup>th</sup>	<b>LABOR DAY – NO LABS</b>	-	-
Sep 13 <sup>th</sup> – Sep 17 <sup>th</sup>	Experiment 1: Fluid Properties	Report 1: Sep 20 <sup>th</sup> – Sep 24 <sup>th</sup>	Quiz 1: Sep 24 <sup>th</sup>
Sep 20 <sup>th</sup> – Sep 24 <sup>th</sup>	<b>NO LABS - JOB FAIR</b>	<b>NO LABS - JOB FAIR</b>	<b>NO LABS - JOB FAIR</b>
Sep 27 <sup>th</sup> – Oct 1 <sup>st</sup>	Experiment 2: Forces on Plane Surfaces/ Archimedes' Principle	Report 2: Oct 4 <sup>th</sup> – Oct 8 <sup>th</sup>	Quiz 2: Oct 8 <sup>th</sup>
Oct 4 <sup>th</sup> – Oct 8 <sup>th</sup>	Experiment 3: Flow Measurements	Report 3: Oct 11 <sup>th</sup> – Oct 15 <sup>th</sup>	Quiz 3: Oct 15 <sup>th</sup>
Oct 11 <sup>th</sup> – Oct 15 <sup>th</sup>	Experiment 4: Major Loss in a Pipe	Report 4: Oct 18 <sup>th</sup> – Oct 22 <sup>nd</sup>	Quiz 4: Oct 22 <sup>nd</sup>
Oct 18 <sup>th</sup> – Oct 22 <sup>nd</sup>	Experiment 5: Energy Losses in a Pipe	Report 5: Oct 25 <sup>th</sup> – Oct 29 <sup>th</sup>	Quiz 5: Oct 29 <sup>th</sup>
Oct 25 <sup>th</sup> – Oct 29 <sup>th</sup>	Experiment 6: Two Stage Centrifugal Pump	Report 7: Nov 1 <sup>st</sup> – Nov 5 <sup>th</sup>	Quiz 7: Nov 5 <sup>th</sup>
Nov 1 <sup>st</sup> – Nov 5 <sup>th</sup>	Experiment 7: Impact of Jet	Report 6: Nov 8 <sup>th</sup> – Nov 12 <sup>th</sup>	Quiz 6: Nov 12 <sup>th</sup>
Nov 8 <sup>th</sup> – Nov 12 <sup>th</sup>	Experiment 8: Manning's Roughness Coefficient	Report 8: Nov 15 <sup>th</sup> – Nov 19 <sup>th</sup>	Quiz 8: Nov 19 <sup>th</sup>
Nov 15 <sup>th</sup> – Nov 19 <sup>th</sup>	No Labs		
Nov 22 <sup>nd</sup> – Nov 26 <sup>th</sup>	<b>THANKSGIVING</b>		
Nov 29 <sup>th</sup> – Dec 3 <sup>rd</sup>	No Labs		

The instructors and the TAs reserve the right to change the above outline depending upon their assessment of the class performance and due to changes in the subject material and other extenuating factors. The changes are not limited to the content and coverage but also include deadlines for homeworks, assignments, project reports and in-term exams.

**Grading: Lab Reports (65%) Effort Sheet (5%) Quizzes (30%)**

**Grading: A :  $\geq 90\%$ ; B:  $\geq 80\%$  and  $< 90\%$ ; C:  $\geq 70\%$  and  $< 80\%$ ; F:  $< 70\%$**

## **Report Format**

**Page 1. - Cover page (3 points)**

Contains title of report, authors of report, dates of report (date of submission & date of experiment), and name of report recipient (Course Instructor). Also please include your course section number.

**Page 2. – Table of Contents (5 points)**

Contains the contents of the report including a list of figures and a list of tables.

**Page 3. - Theory page (22 points)**

Background - Contains a derivation of the theory/equation behind the experiment. Typically, it will involve application of the Continuity, Energy and/or Momentum Equations to a specific control volume and will result in either an equation for flow rate, pressure change or applied force that will be measured in the experiment. Describe any equations used to perform the analysis of the experiment.

**Page 4. - Apparatus page (5 points)**

Contain a sketch of the apparatus and a list of the variables used/measured in the experiment (with units).

**Page 5. - Results page (20 points)**

Contains graphs and tables of interpreted results. Results will involve a comparison between measured (from experiment) and predicted (from theory) results. Briefly explain your results. Label graphs and tables per ASCE format. ***Do not show a graph or a table without an explanation.***

**Page 6. - Discussion page/s (20 points)**

Contains a discussion of the results and should comprise;

1. A comment on whether the purpose of the experiment was met, and if not, why not.
2. Answer specific questions in the Interpretation Section of the Experiment Instructions.
3. A discussion on where discrepancies and sources of error might arise.
4. A real life application of this apparatus/experiment.

**Page 7. - Data Appendix (5 points)**

Contains the original data sheets for the experiment (Completely filled out).

**Page 8. Error Analysis Calculations (10 points)**

Contains a sample calculation of error analysis for **one** lab trial. A table of calculated error analysis values for all trials will be included in the error analysis section.

**Page 9. Sample Calculations (10 points)**

Contains a sample of your calculations, but not all repetitive calculations. Every equation used in a calculation needs to have a sample shown.

### Effort Sheet (5% of the overall Laboratory Grade)

Student Name	Tasks Performed	Remarks

We attest that the tasks outlined in the above table represent an accurate depiction of the work performed by the group members. Use the remarks column to add any comments (e.g., timeliness) or note any disagreements.

**Signatures: (Must be signed by all group members)**

Name: \_\_\_\_\_ Signature \_\_\_\_\_

Name: \_\_\_\_\_ Signature \_\_\_\_\_

Name: \_\_\_\_\_ Signature \_\_\_\_\_

Name: \_\_\_\_\_ Signature \_\_\_\_\_

Name: \_\_\_\_\_ Signature \_\_\_\_\_

Date: \_\_\_\_\_

**Lab Reports (65%):**

Laboratory reports will be graded out of 100 points (see lab report rubric attached). The lab reports will count towards 65% of your overall grade. All members of the group will get the same grade for their submitted lab report. Students missing labs will automatically receive a zero on their lab report. Students are strongly encouraged to use spreadsheets to automate their calculations and make charts but are required to show at least one set of calculations by hand.

**Team Effort Sheet (5%)**

As part of the lab report submission, each team will fill out a peer-assessment sheet indicating efforts of all the team members for that particular lab. The peer-evaluation will constitute 5% of your grade. Therefore, each student will receive an individual grade based upon both their work as a group, and their classmates' assessment of their contribution to the final product. Students missing labs will automatically receive a zero on their team effort sheet.

**Quizzes (30%):**

All quizzes will be conducted online using the blackboard content management system. Quizzes will be posted on Friday of each week (after all of the labs for the week are complete) and all students will have till the following Friday till 5:00 PM to complete the quizzes. Students can take quizzes even if they are not in attendance of the lab. **There will be no makeup quizzes.** Once the quiz is closed it will not be opened up for any reason. Each Quiz will generally take no more than 15 minutes so there is ample time provided to complete them. Students are given at least two attempts for each question of the quiz. **It is important that students hit the submit button to ensure the quiz is recorded in the system. Failure to do so will result in quiz grades not being rolled into the blackboard system and will affect the student's grade.**

**Specific Course Objectives**

Each student at the end of the course should be able to perform the following tasks:

1. Utilize the fluid properties with the right units to solve fluid problems.
2. Solve manometer problems through application of fundamental equation of fluid statics.
3. Determine the pressures, and forces and their line of action, for a fluid at rest on plane and curved surfaces.
4. Identify a control volume.
5. Be able to apply the conservation of mass principle to a control volume.
6. Be able to apply the conservation of energy principle to a control volume.
7. Be able to apply the conservation of momentum principle to a control volume.
8. Solve channel transitions (width/bed level changes) in open channel flow problems.
9. Observe the difference between the behavior of a real and a theoretical fluid.

**Experiments (tentative)**

1. Fluid Properties
2. Forces on Plane Surfaces/ Archimedes' Principle
3. Flow Measurement Apparatus
4. Friction Loss in Pipe
5. Pipework Energy Losses
6. Two-Stage Centrifugal Pump Test
7. Impact of Jet
8. Manning's Roughness Coefficient Determination

**Laboratory Safety**

Students must adhere to safety procedures and protocols and follow the instructions provided by the Lab Instructors at all times. Students should also wear proper attire to the labs (e.g., close toe shoes, full pants).

All students must complete the safety training prior to working in the lab. The training can be accessed at - <https://www.depts.ttu.edu/ehs/Training>. The students must print their certificate of completion and present it to the instructor and upload it on Blackboard.

**Required:**

Scientific calculator (Must be on the list approved by Civil Engineering Department as mentioned below.)

***Calculators:***

Only NCEES approved calculators will be permitted during tests, otherwise your test will be collected and your grade will be a zero if you are caught using a non-approved calculator. The approved calculators include the following:

- Hewlett Packard - HP 30s, HP 33s, HP 9s
- Casio - FX 115 ES, FX 115 MS, and FX 115 MS Plus (Note: FX 115 ES and FX 115 MS models ending with an "-SR" designation are also allowed.)
- Texas Instruments - TI 30XA (or TI 30Xa), TI 30X IIS and TI 30X IIB, TI 36X Solar
- If you are unsure about your calculator, it is your responsibility to check with the instructors for approval.

**Laptops/PDAs/MP3 Players/Cell Phones/ etc.:**

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. The use of phones and MP3 players is not permitted during lessons.

## INSTITUTIONALLY REQUIRED INFORMATION

### **ADA STATEMENT:**

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 West Hall or call 806-742-2405.

### **ACADEMIC INTEGRITY STATEMENT:**

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 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:**

"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. 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. 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.

### **DISCRIMINATION, HARASSMENT, AND SEXUAL VIOLENCE STATEMENT:**

Texas Tech University is committed to providing and strengthening an educational, working, and living environment where students, faculty, staff, and visitors are free from gender and/or sex discrimination of any kind. Sexual assault, discrimination, harassment, and other [Title IX violations](#) are not tolerated by the University. Report any incidents to the Office for Student Rights & Resolution, (806)-742-SAFE (7233) or file a report online at [titleix.ttu.edu/students](http://titleix.ttu.edu/students). Faculty and staff members at TTU are committed to connecting you to resources on campus. Some of these available resources are: TTU Student Counseling Center, 806-742-3674, <https://www.depts.ttu.edu/scc/> (Provides confidential



support on campus.) TTU 24-hour Crisis Helpline, 806-742-5555, (Assists students who are experiencing a mental health or interpersonal violence crisis. If you call the helpline, you will speak with a mental health counselor.) Voice of Hope Lubbock Rape Crisis Center, 806-763-7273, [voiceofhopelubbock.org](http://voiceofhopelubbock.org) (24-hour hotline that provides support for survivors of sexual violence.) The Risk, Intervention, Safety and Education (RISE) Office, 806-742-2110, <https://www.depts.ttu.edu/rise/> (Provides a range of resources and support options focused on prevention education and student wellness.) Texas Tech Police Department, 806-742-3931, <http://www.depts.ttu.edu/ttpd/> (To report criminal activity that occurs on or near Texas Tech campus.)

#### **CIVILITY IN THE CLASSROOM STATEMENT:**

Texas Tech University is a community of faculty, students, and staff that enjoys an expectation of cooperation, professionalism, and civility during the conduct of all forms of university business, including the conduct of student–student and student–faculty interactions in and out of the classroom. Further, the classroom is a setting in which an exchange of ideas and creative thinking should be encouraged and where intellectual growth and development are fostered. Students who disrupt this classroom mission by rude, sarcastic, threatening, abusive or obscene language and/or behavior will be subject to appropriate sanctions according to university policy. Likewise, faculty members are expected to maintain the highest standards of professionalism in all interactions with all constituents of the university ([www.depts.ttu.edu/ethics/matadorchallenge/ethicalprinciples.php](http://www.depts.ttu.edu/ethics/matadorchallenge/ethicalprinciples.php)).

#### **LGBTQIA SUPPORT STATEMENT:**

Office of LGBTQIA, Student Union Building Room 201, [www.lgbtqia.ttu.edu](http://www.lgbtqia.ttu.edu), 806.742.5433 within the Center for Campus Life, the Office serves the Texas Tech community through facilitation and leadership of programming and advocacy efforts. This work is aimed at strengthening the lesbian, gay, bisexual, transgender, queer, intersex, and asexual (LGBTQIA) community and sustaining an inclusive campus that welcomes people of all sexual orientations, gender identities, and gender expressions.

## INTRODUCTION TO ACCREDITATION BOARD FOR ENGINEERING AND TECHNOLOGY (ABET)

ABET is a nonprofit, non-governmental accrediting agency for programs in applied and natural science, computing, engineering and engineering technology and ABET is recognized as an accreditor by the Council for Higher Education Accreditation.

To date, over 3,700 programs at more than 750 colleges and universities in 30 countries have received ABET accreditation. Approximately 85,000 students graduate from ABET-accredited programs each year, and millions of graduates have received degrees from ABET-accredited programs since 1932.

### Why ABET Accreditation?

It ensures that graduates have met the educational requirements necessary to enter the profession. It provides opportunities for the industry to guide the educational process to reflect current and future needs. It enhances the mobility of professionals

### What Accreditation Means?

#### 1. Students

Be confident in your education—ABET accreditation is the trusted standard for employers worldwide.

#### 2. Programs & Institutions

ABET accreditation demonstrates your commitment to delivering quality education.

#### 3. Industry, Government & the World

Employers can trust that graduates of ABET-accredited programs are prepared to enter the workforce and make a positive contribution to the global society

### Why assess student performance in courses?

To be an ABET accredited, the program must regularly use appropriate, documented processes for assessing and evaluating the extent to which the ABET student outcomes are being attained. The results of these evaluations must be systematically utilized as input for continuously improving the program. Evidence of achieving those outcomes are based on employers comments, senior exit surveys, industry assessment, and course performance

### ABET Student Outcomes

Student outcomes are items that should be learned by the end of the class and are selected on a per course basis.

- a) an ability to apply knowledge of mathematics, science, and engineering

- b) an ability to design and conduct experiments, as well as to analyze and interpret data
- c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- d) an ability to function on multidisciplinary teams
- e) an ability to identify, formulate, and solve engineering problems
- f) an understanding of professional and ethical responsibility
- g) an ability to communicate effectively
- h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- i) a recognition of the need for, and an ability to engage in life-long learning
- j) a knowledge of contemporary issues
- k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

### **What do we expect of our graduates?**

#### *Program Educational Objectives (civil engineering):*

Graduates will meet the expectations of employers of civil engineers. Graduates will continue their professional development through graduate study if qualified and continuing education.

#### *Program Educational Objectives (construction engineering):*

Most graduates will become successful practitioners in construction engineering and relevant careers. Most graduates will be involved in professional development activities to improve their professional skills and enhance their professional credentials. Most graduates will contribute to their communities

#### *Program Educational Objectives (environmental engineering):*

Graduates will meet the expectations of employers of environmental engineers. Graduates will continue their professional development through continuing education.

For further information visit the following link

<http://www.abet.org/accreditation/accreditation-criteria/criteria-for-accrediting-engineering-programs-2017-2018/#outcomes>